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Cylinder Boring and Facing Machine.

This machine, of which we present an engraving, was designed by W. J. Muncaster, and is manufactured by Muncaster & McKaig, Cumberland, Md.

The machine consists of a heavy bed or frame, closed on its top, upon which are mounted two sliding heads, which are journaled to receive the boring-bar.

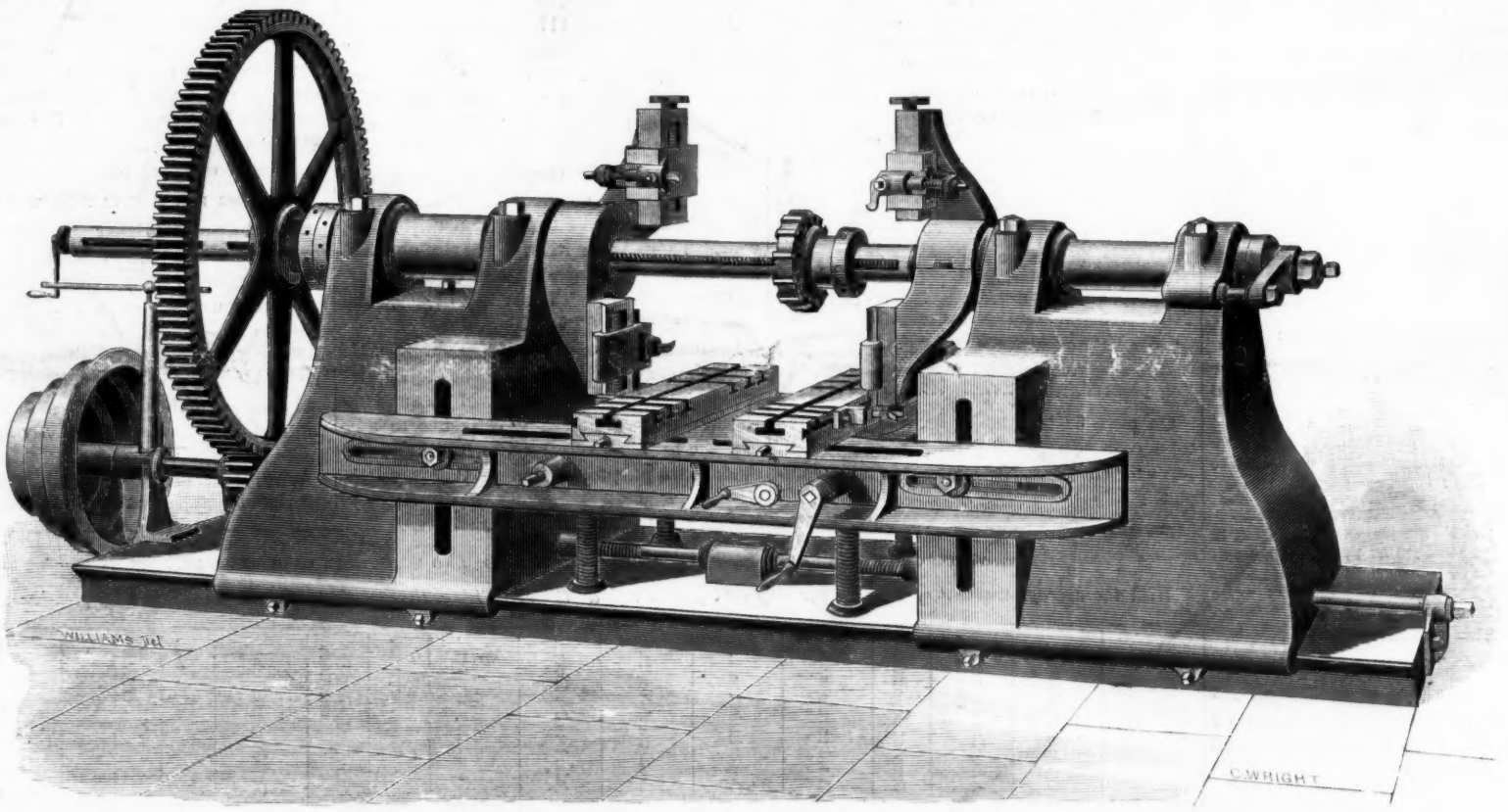
A right and left-hand screw is used to draw these heads together or apart, to suit different lengths of work. A heavy table, shaped like the letter H, is placed between the two heads, having elongated openings in the projecting arms; there are similar openings in the heads, which permit two clamping-bolts to be used. These bolts pass through and bind the projecting arms firmly to the heads.

The table is supported by four heavy screws, which are so connected to each other that by turning a crank placed on the projecting square of the cross-shaft at either end, the bed can be raised or lowered bodily. By throwing the connecting shaft out of gear by means of the small crank shown, either end of the bed can be raised or lowered independently of the other.

For securing the work to the table two cross-slides are used; these can be moved to suit the different lengths of the work. When the work is securely bolted down it can be adjusted at either end, sidewise or up and down. This enables the work to be quickly and accurately centered true to the boring-bar.

The boring and facing can be done at the same time. At the left-hand end of the bed is shown a cone pulley, by which the machine is driven; this cone is secured to a shaft, which gives motion to a pinion gearing into the large spur wheel, which latter is secured to the hollow shaft in the left-hand head. This gives motion to the boring-bar and to the facing-heads. To place the work on the machine, or to remove it, the boring-bar is withdrawn out of the way by driving out the key which connects it to the right-hand facing-head, then by loosening a set-screw that binds a key in hollow spindle to the boring-bar, and by which it is driven.

The boring-head has a positive feed; a crank is placed at the end of the bar by which the head is quickly adjusted. The cross-feed has a star feed. The machine shown is capable of boring from 8″ to 24″ diameter, and facing off from 12″ to 50″ long.



CYLINDER BORING AND FACING MACHINE.

Activity at Brooklyn Navy Yard.

Affairs in Brooklyn Navy Yard are decidedly lively at present. Some 850 men are employed in the yard, about 65 being machinists, 60 blacksmiths, 50 boiler-makers and other tradesmen in proportion.

About five hundred of these hands have been taken on within the last month, but some of the old hands have been discharged to make room for new ones.

The Richmond is being thoroughly overhauled. Her engines, together with those of the Essex, are being removed to the machine shop to be put in perfect repair. The old boilers which have laid at the foot of Fourth street (in the Navy Yard) for the last six or seven years, are being cut down from six furnaces to three, and will be placed on board the Richmond which is expected to be ready for sea during the autumn of 1886.

The Tallapoosa, with a row of port-holes fore and aft, is having a new upper deck. She will soon be ready to sail to China.

The Intrepid is stripped to the water-line, and is to be rebuilt seven feet higher. Her engines, which run two screws, are also to be overhauled.

We are informed that this vessel was intended to be lengthened 50 feet, but it has since been decided to increase her depth instead.

The ram Mianatonock is being made ready for two new turrets of Sheffield make. Alongside of this vessel is the Pawtucket, which is also undergoing repairs. A gang of caulkers have possession of the Tennessee, She is in the dry dock, and is having a "toilet shampoo."

The U. S. S. Nina which was fitted with the Kunstadter steering screw, and which has been the subject of elaborate engineering reports, has just been discharged from dry-dock. Her steering screw has been removed and replaced by the old rudder. A number of steam launches are being put in order; boats overhauled and a general revamping seems in order.

The engine which drives the yard machine shop is having her valves overhauled and reseated. This engine is double; her cylinders are 17″ in diameter; she has never yet been driven to her whole power, and even one cylinder has proved too large for the work required, and her use of steam was not economical. To remedy the trouble the right-hand cylinder was bushed down to 13″ about seven years ago. It has proved a good investment. A plain cast-iron shell 2″ thick, was turned to fit the cylinder; it was pressed into place and caulked at both ends. Doubtless a similar bushing of large engines would pay in cases where little power is required of a large engine.

"What is all this repairing for?" we asked an intelligent-looking mechanic, as he was furbishing up a piece of the Essex, "why don't they throw away all this old junk, and build one or two new craft?" "Well," said the mechanic, "they have got the idea that we cannot do such work here. They want to do something, so they do this. Whitney belongs here, you know." "Seems to me," we said, "that you have got a very good plant here. What is your opinion of the capabilities of the yard?" "Well, sir," said the mechanic, "just give us a chance to build a ship, and we will show you what we can do."

Brazing Cast Iron.

"What is the reason that I cannot braze cast iron?" asked a machinist the other day. "Every time I try it I fail. Sometimes the cast iron burns away, and sometimes the brass will not stick. What is the trouble?"

Cast iron may be easily brazed, if, like doing other peculiar jobs, "you know how to do it." Have the iron clean; make it free from grease and acids, which may be injurious; choose any soft brass, or make some for this purpose. The yellow brass used in brazing copper will do; it must contain a large percentage of zinc, or its melting point will be not much lower than that of the cast iron itself.

Put on the borax before heating the iron. Dissolve the borax, and apply the solution freely to the parts to be brazed. By doing this before heating, a film of oxide is prevented from forming upon the iron. Fasten the parts together, and heat in a clear charcoal fire. Soft coal is not suitable; there is too much sulphur in it.

Heat the work gradually. Apply heat to the largest piece, and keep that piece the hottest. Sprinkle on powdered borax and brass filings, and use plenty of borax. Watch carefully, and get the iron up to a red heat before any of the brass melts. The brass will not adhere unless the iron is hot enough to melt the brass.

Be very careful not to get the iron too hot, or away it melts and the job is lost. When the brass "runs," remove from the fire immediately, and wipe off the superfluous brass, cool off slowly, and finish up the joint.

Booming the Prison Contract System by False Financial Statements.

In the morning newspapers, the first day of every month, may be found an Associated Press dispatch giving what purports to be the amount of earnings, the total expenses and the profits of Sing Sing Prison for the preceding month. These statements are apparently made by authority, and are so accepted by the public. The figures of profit range from $6,000 to $7,000 a month, and form the text for many editorials commending the beauteous working of the contract system of prison labor, and ranting about the folly of dropping that system for any other that does not allow a few individuals to run the prisons as manufactories for their own private gain, in opposition to free citizen labor. Taxpayers are led to believe that the proceeds of prison contracts in this State more than pay the current necessary expenses for maintaining the three prisons, and that the prisons don't cost the taxpayers a cent. Indeed, the newspaper touters for contractors ring the changes on "Surplus Earnings" and "Self-Supporting Prisons" so persistently that the average reader, who generally believes any simple statement he sees in his own party or church paper, without searching for proof, swallows the illusion that the prisons are turning a nice "surplus" into the State treasury every year.

Until recently we had not seen the annual report of Mr. Baker, the New York State Superintendent of Prisons, but, upon procuring and examining a copy of his report for the year ending the 30th of last September, we feel bound to say that the matter contained in it is so presented as to heighten and not to dispel that illusion.

The report contains 186 closely-printed pages. Opening to the first page, we find a financial statement, which, when compared with the report of Comptroller Chapin (by whom all warrants for State expenditures must be drawn), becomes decidedly astonishing.

The two statements are as follows:

STATE OF NEW YORK: REPORT OF SUPERINTENDENT OF STATE PRISONS FOR YEAR ENDING SEPTEMBER 30, 1884. (*Page* 1.)

For the last fiscal year the earnings and expenditures for the care and maintenance of the State prisons are as follows:

	Earnings.	Expenditures.	Surplus and Deficits.
Auburn	$114,367 19	$115,058 88	D. $691 69
Sing Sing	239,285 34	176,071 12	S. 63,214 22
Clinton	47,506 66	99,371 22	D. 51,864 56
Totals	$401,159 19	$390,501 22	
Showing net surplus earnings for the year			$10,657 97

EXPENDITURES FOR STATE PRISONS FROM ANNUAL REPORT OF COMPTROLLER STATE OF NEW YORK, FOR YEAR ENDING SEPTEMBER 30, 1884. (*Page* 53.)

Auburn:		
Support	$113,048 42	
Water for prison and asylum for insane convicts	2,500 00	
Ordinary repairs	4,375 00	
Surgical operation on convict	700 00	
		$120,623 42
Clinton:		
Support	$100,002 93	
Repairs	4,000 00	
Damages for breach of contract for construction of railroad	6,096 67	
Heating apparatus, etc	10,025 50	
For instruction of convicts	250 00	
		120,375 10
Sing Sing:		
Support	$176,116 59	
Ordinary repairs	14,000 00	
Water	1,500 00	
Instructor	250 00	
		191,866 59
Salary and expenses of superintendent		6,922 95
Clerk hire		1,375 00
Agent for discharged convicts, salary	$2,500 00	
Expenses	5,000 00	
		7,500 00
Transportation of convicts		12,909 24
Total		$461,572 30

STATE PRISON EARNINGS FROM COMPTROLLERS' REPORT FOR YEAR ENDING SEPTEMBER 30, 1884. (*Page* 38.)

Auburn	$115,408 09
Clinton	46,899 74
Sing Sing	238,179 56
	$400,487 39

It will thus be seen that if Comptroller Chapin's accounts are straight he has paid out for prisons something over $61,000 more than the treasury has received from that source during the year, or, to confine our comparison strictly to necessary running expenses, he has paid upwards of $15,700 more for *support, ordinary repairs and water* for the prisons during the year than their total earnings for that period. According to Chapin, the earnings fell considerably short of meeting ordinary expenses. According to Baker, the "net surplus earnings" were over $10,600.

Having found so much interesting arithmetic on the first page of Baker's report, we were prompted to peruse it throughout. All the tables and statements contained in this report are ingeniously marshalled into line to show the beatific results of the private contract system of employing convicts. No lawyer could be expected to plead for his client with greater zeal than Baker pleads for a perpetuation of the contract system in the prisons.

Turning to page 45 of the pamphlet, we find the report of Warden Brush, of Sing Sing Prison. His general balance sheet shows thus:

AGENT AND WARDEN OF SING SING PRISON IN ACCOUNT CURRENT WITH THE STATE OF NEW YORK, FOR CASH RECEIVED AND EXPENDED FOR THE USE OF SAID PRISON FOR THE YEAR ENDING SEPTEMBER 30, 1884:

Dr.	
To cash on hand October 1, 1883	$172 36
To Treasurer's drafts for maintenance	176,116 59
Received from all other sources	238,179 56
Total	$414,468 51
Cr.	
By total expenditures, maintenance	$176,071 12
By deposits to credit Treasurer State of New York	238,179 56
By balance on hand September 30, 1884	217 83
Total	$414,468 51
Total expenditures for the support of Sing Sing Prison during the year ending September 30, 1884	$176,071 12
Total earnings for same period, convict labor, miscellaneous earnings, etc	239,285 34
Showing for the fiscal year a net profit of	$63,214 22

On page 52 is a table purporting to give total cash receipts and total cash expenditures for the year. We copy this table complete:

expended in repairs of buildings, roads, bridges, drains and bath-tubs, and in the purchase of machinery and tools."

There is nothing to indicate that this is not a part of the "total expenditures" mentioned in several places.

The "general statement and averages," on page 57, figures "an excess of earnings over receipts of $63,214.22." The Comptroller's report shows a much smaller excess.

Turning to the report of Warden Lanehart, of Auburn Prison, on page 89, we find the "total expenditures" of the year given as $115,058.88. Again on page 90, the "total amount of expenditures" is stated at the same figures. Again, on page 93, in a table of earnings and expenditures by months, the expenditures for the year are given precisely the same.

Once more, on page 96, the "total amount of expenditures for the year" is declared to be $115,058.88. There is no mistaking the purport of these statements. If they are correct, the report of Comptroller Chapin is grossly in error. On page 110 is a report of the yardmaster and engineer of Auburn Prison to Warden Lanehart, giving cost of various repairs, but nothing is said to indicate that these expenses are not included in the general financial statement of the Warden.

On page 116, in a table of "total earnings and cash receipts and the total cash expenditures" at Clinton Prison for the year ending September 30, 1884, the "total expenditures" are given as $99,371.22.

Again, on page 117, this same sum is given as the "total amount of expenditures," and on page 120, for the third time, that same sum is declared "the total amount of expenditures for the year." The purport of such an official statement is plain enough to anybody. Yet the Comptroller certifies to having paid out considerably more money for the expenses of that prison during the year. There is an item, however, on page 120, noting the expenditure of $850 for furnishing the Warden's house out of a special appropriation of $9,992.25.

In the whole of Superintendent Baker's report we can find nothing about any special expenditure for water for any of the prisons. Neither do we find any reference to any expense for his own salary, or for any of the other extra purposes noted in Comptroller's report.

Of this "special" expense, $5,183.68 was for labor of prisoners at 60 cents a day, and officers at $75 a month, in making such repairs as glazing, laying water pipes, making and repairing tinware, painting, altering Warden's house, roofing and other like jobs. These items of expense are computed by Warden Brush every month, and the money drawn from the Treasury at intervals (four or five times a year) to cover the amounts thus figured as expenses. The amount thereby earned by the prisoners is afterwards turned over to the State Treasurer as prison earnings. A degree of ingenuity, however, is displayed in working these transactions into the financial statement at the end of the year that should secure Superintendent Baker the prize medal at a competitive examination of book-keepers. The expenses of prisoners' labor thus applied are not included at all in the total expenses of the prisons, but their earning in making those repairs are carefully figured in the statement of prison receipts to swell the "surplus," which the public are given to understand is over and above all expenses.

The other expenses, under the head of "Ordinary Repairs, Special," are such as are necessary for the running of the prison. They include bills for lumber, paint, oil, hardware, scales and repairs to scales, kitchen knives, steam fittings, lamp burners and chimneys, stoves, repairs to furniture, glass, grate bars, electric bells, iron and brass castings, brick, sash, gravel for roofing, stools, repairing tools, repairs to wagons and harness, rope belting, cord-wood, charcoal, acid, stove blacking, brushes and like articles. A new boiler for the shoe shop and some new bath-tubs (costing about $1,500) are the only articles that could not be classed under the heading of ordinary prison expenses.

PLEADING FOR MAINTAINING THE SYSTEM.

Superintendent Baker pleads with all his force for the retention of the private contract system of employing convicts. The last previous legislature had passed an act that no more contracts should be let, but Baker, in his report, impudently calls upon the Legislature to give reasons why that body should make any change in the plan of employing convicts. He delivers himself thus:

Why shall the labor of all the available convicts be employed on State account?

ABSTRACT OF THE TOTAL EARNINGS AND CASH RECEIPTS, AND THE TOTAL CASH EXPENDITURES,

With the average number of convicts per day and per month at the Sing Sing Prison, from October 1, 1883, *to September* 30, 1884.

MONTHS.	Contract earnings.	Miscellaneous earnings.	Convict deposits.	Total earnings.	Deposits in bank.	Treasurer's draft.	Salaries of officers.	Expenditures for ordinary support.	Expenditures for building, repairs, etc.	Convict deposits refunded.	Total expenditures.	No. convicts on contract.	No. not on contract.	No. at close of month.	Monthly average.	Surplus.
1883.																
October	$19,287 22	$1,388 27	$2 15	$20,677 64	$19,003 72	$16,937 06	$5,776 83	$9,722 65	$14 62	$127 19	$15,641 29	1,269	229	1,498	1,486	$5,036 35
November	17,324 30	1,475 07	92 40	18,891 77	20,554 69	13,057 90	5,879 81	7,977 03	13 41	21 20	13,891 45	1,248	244	1,492	1,501	5,000 32
December	17,880 72	1,661 12	15 55	19,557 29	19,000 97	15,629 46	5,942 21	9,554 44	8 43	26 16	15,531 24	1,246	265	1,511	1,507	4,026 15
1884.																
January	18,883 52	1,152 54	98 07	30,134 13	19,131 33	15,254 33	5,838 17	10,188 38	21 03	50 11	16,097 69	1,226	232	1,458	1,472	4,036 44
February	17,585 76	665 20	48 05	18,299 01	19,596 77	14,566 31	5,889 92	8,329 38	10 84	68 26	14,298 40	1,246	247	1,493	1,474	4,000 61
March	18,770 52	964 23	28 69	19,763 44	18,578 68	15,338 62	5,858 80	8,841 37	36 17	8 07	14,744 41	1,281	260	1,541	1,518	5,019 03
April	18,985 72	1,038 76	59 11	20,083 59	19,868 39	14,775 39	5,951 14	9,066 55	6 55	59 23	15,083 47	1,276	263	1,539	1,538	5,000 12
May	19,810 90	1,407 78	14 35	21,233 03	20,407 85	15,470 87	5,869 78	9,243 67	9 53	58 54	15,181 52	1,289	277	1,566	1,552	6,051 51
June	18,312 12	1,434 79	31 17	19,778 08	21,276 86	13,820 17	5,905 80	7,814 90	10 87	45 30	13,776 87	1,296	256	1 552	1,545	6,001 21
July	19,049 66	1,218 80	111 09	20,379 55	19,642 01	14,391 12	5,710 41	8,545 06	19 27	78 43	14,353 17	1,275	274	1,549	1,552	6,026 38
August	18,816 38	1,502 15	47 11	20,365 64	20,598 92	14,308 32	5,753 62	8,553 70	19 28	23 84	14,350 44	1,262	287	1,549	1,551	6,015 20
September	18,722 08	1,360 23	39 76	20,122 07	20,216 37	11,764 04	5,976 27	6,998 77	18 23	127 90	13,121 17	1,260	279	1,536	1,564	7,000 90
Totals	$223,428 90	$15,268 94	$587 50	$239,285 34	$238,179 56	$176,116 59	$70,352 76	$104,835 90	$188 23	$694 23	$176,071 12	15,174	3,113	18,287	18,260	$63,214 22

Monthly average of convicts in prison, 1,522; monthly average of convicts on contract, 1,262.

NOTE.—"Ordinary support" is found by deducting from "total expenditures" the totals of "salaries of officers," "expenditures for buildings and repairs" and "convict deposit refunded."

STATEMENTS OF TOTAL EXPENDITURES.

On page 53 is a statement of expenditures by estimates for the year, in which the "Total Expenditures" are given as $176,071.12. On page 55 is a table of earnings, expenditures and surplus by months, in which the total of expenditures is again given—$176,071.12. Again, on page 57, under the head of "General Statement and Averages," "the total amount of expenditures for the year" is also given as $176,071.12. There is nothing in the report of Warden Brush to show that any item of expense has been left out in figuring the above total, although in one place he says:

"Fourteen thousand dollars have been

With the two contradictory reports above mentioned before us, we visited the Comptroller's office in Albany, and were permitted to examine all the books, papers and vouchers bearing upon the subject.

We found that outside of the regular account for "Buildings and Repairs" there is a separate account made for repairs and new buildings in each prison. In addition to the $176,071.12, which in Superintendent Baker's report is several times mentioned as the total expenses of Sing Sing Prison for the year, $14,000 was expended under the head of "Ordinary Repairs, Special," during that year. We examined the bills and vouchers for this account.

This is the pregnant inquiry which is addressed to all those in authority in the State, who have anything to do with the administration of the prisons.

Shall a change be made for sanitary reasons?

The physicians report the prisoners in a high degree of health, better than ever before.

Shall a change be made for moral or reformatory reasons?

The wardens and other officers report that the order, the discipline, the *morale* of the prisoners were never so excellent as they are now.

Shall a change be made for financial reasons?

The net earnings of the prisons were the largest during the last year they have ever been.

Shall a change be made because any deterioration in the system has been discovered or any bad tendencies?

The statistical statements and the accompanying reports of the prison officers demonstrate that no such condition is known; but on the contrary, constant and manifest improvement is going on.

Then, why shall the change be made? Is it to remove alleged competition in labor and injury to free labor?

This official, who is working so hard for the interests of the contractors, should know that by a direct vote the people of the State decided by 139,000 majority that the contract system should be abolished. This very plain reason seems to have escaped his attention. The people had already discussed the injury to free labor, and rendered a verdict that it should cease. The Legislature they elected to carry out their wishes, is the body to whom the above appeal is made by the Superintendent of Prisons. He seems to be more anxious to advance the interests of contractors than the expressed desires of the people of the State. This is a queer position for a State official to occupy and defend. He declares boldly that "the force of competition is trivial, as appears when it is examined rigorously," evidently assuming that a part of his duties is to advance opinions in opposition to the majority of the people. With equal confidence he declares (page 28): "The prisons are now self-supporting. They have been made so since the present system was established. They were not so before it was adopted."

We have carefully examined the State Comptroller's reports for the last four years, or during the time Baker figures the prisons as being self-supporting. The Comptroller's reports, instead of showing a surplus of prison earnings, show an excess of expenditures every year, making a considerable deficiency. Leaving out every extraordinary expense, and *including only the ordinary expenses of maintaining the prisons, the Comptroller's reports show a deficiency every year in the history of the prisons.*

"It is to be regretted," says Supt. Baker in his report, "that a commission was not selected by the last Legislature to examine the whole subject in a deliberate and careful manner, and to make report thereon to the Legislature at the opening of the session." It will be regretted if the next Legislature does not select a commission to examine into the peculiar methods he pursues to make the prisons show "surplus" earnings under his favorite contract system. If the financial statements of the Comptroller and the Superintendent of Prisons cannot be made to harmonize better than those presented to the last Legislature an official investigation is badly needed.

The necessary expenses of conducting the prisons ("Care and Maintenance") must include water and ordinary repairs. The money paid for extra repairs and buildings is also an expense chargeable to taxpayers, and no statement of total expenses of prisons should be accepted that ignores any expense account. The only object of misstating total expenses, while mentioning total earnings, must be to cause the public to believe that the prison contract system is producing better financial results than it really is.

EXCESS OF PRISON EXPENSES OVER THE EARNINGS FOR SIX YEARS.

We make the following abstract of prison finances from the reports of Comptrollers for the last six years. This exhibit does not include reformatories or penitentiaries:

For the Year Ending September 30, 1879.	
Total payments	$636,148 06
Receipts	406,661 95
Excess of payments	$229,486 11
For the Year Ending September 30, 1880.	
Total payments	$634,541 47
Receipts	388,167 10
Excess of payments	$246,374 37
For the Year Ending September 30, 1881.	
Total payments	$501,484 92
Receipts	403,542 13
Excess of payments	$97,942 79
For the Year Ending September 30, 1882.	
Total payments	$472,314 24
Receipts	419,183 11
Excess of payments	$53,131 13
For the Year Ending September 30, 1883.	
Total payments	$453,672 74
Receipts	409,883 64
Excess of payments	$43,789 10
For the Year Ending September 30, 1884.	
Total payments	$461,572 30
Receipts	400,487 39
Excess of payments	$61,084 91

In the above exhibits, "excess of payments" each year represents the amount the taxpayers of the State have been obliged to contribute to maintain and keep up the three prisons. No State Comptroller has been able to figure out a "surplus," or to make any financial statement showing the prisons to be "self-sustaining."

ALLEGED EXCESS OF EARNINGS OVER EXPENSES FOR FOUR YEARS.

Turning to Superintendent Baker's report (page 13), we find a table with the heading, "Showing expenditures, earnings, deficit or surplus in each prison for eight years." We make some extracts:

Year 1879—Expenses	$422,737 97
" —Earnings	402,363 79
Net deficiency	$20,374 18
Year 1880—Expenses	$404,993 13
" —Earnings	386,906 15
Net deficiency	$18,086 98
Year 1881—Expenses	$403,791 56
" —Earnings	404,355 91
Net surplus	$564 35
Year 1882—Expenses	$415,660 10
" —Earnings	421,917 68
Net surplus	$6,257 58
Year 1883—Expenses	$397,955 35
" —Earnings	407,061 58
Net surplus	$9,106 23
Year 1884—Expenses	$390,501 22
" —Earnings	401,159 19
Net surplus income	$10,657 97

We can readily believe Baker when he says "there is more significance in these several tables than may appear to the cursory examiner of them." To the great mass of people who have never compared the well published financial statements of the prisons with the statements of the Comptroller, the tables have a peculiar significance.

THE LARGEST PRISON CONTRACT TAKEN TO BEAT FREE MECHANICS.

The largest prison labor contract in this country is that of Perry & Co., who employ 900 convicts in Sing Sing prison at the rate of 56 cents a day. This firm was given the first contract by Supt. Pilsbury in 1877. Turning to page 85 of Baker's Report we find the following history of this contract:

Soon after Mr. Pilsbury entered upon his term of office, application was made to him for a large number of convict laborers in the Sing Sing prison by a firm of stove manufacturers carrying on business in the city of Albany. That was an industry not theretofore carried on in the prisons of the State, at least to any considerable extent, and at this time was entered upon by the manufacturing firm aforesaid as a last resort to protect themselves against a formidable strike inaugurated and stoutly maintained in their establishment at Albany. A large number of men were employed, and the industry was successfully carried on through Mr. Pilsbury's administration, and continues with unabated success under the administration of Mr. Baker.

As might be expected, the firm, Perry & Co., beat the free workmen by securing this contract, and obtained their labor on the terms they (the firm) chose to offer. Yet in another part of his report (above quoted) Baker placidly informs us that "the force of the competition is trivial."

So long as prison labor contracts continue in any of the States free mechanics are threatened, and none can tell in what trade the next blow will fall.

EXTRA ADVANTAGES ENJOYED BY CONTRACTORS.

Those who think that the extreme low wages paid for prison labor is the only advantage the contractors have over outside manufacturers are very much mistaken. The Sing Sing stove contract, made Feb. 1, 1881, in which Warden Brush is the party of the first part, and Perry & Co. party of the second part, provided that the firm shall have, "without charge for rent, the free and exclusive use of the buildings now in use and possession of said party of the second part, except the building known as the hat shop, situated within the walls of said prison; also the steam engine, boiler, and other machinery, tools, fixtures, shafting, belting, office furniture, etc., now contained in said buildings, so far as the same is the property or under the control of the party of the first part."

The buildings are to be kept in repair free, "and in case any of them shall be injured or destroyed by fire or other casuality, the same shall be immediately repaired or rebuilt, at the cost and charge of the said party of the first part."

Furthermore, Perry & Co. are to have "the free use of the dock for loading or unloading freight, and also to maintain a track from the railroad through the yard, and to have free ingress and egress for cars" during work hours. Perry & Co. are only to furnish fuel and cupolas, blowers and special stove-making machinery.

The other prison contracts have like privileges attached. Outside manufacturers and workmen are obliged to compete with prison manufacturers who have shop rent free, power plant and fixtures free, office furniture free, wharfage free, repairs free, insurance free, and labor at 30 to 56 cents a day. "But," says some defender of the contract system, "prison labor does not produce as much work as free labor." Fortunately, Mr. Perry, in a pamphlet he has published, gives us a basis for comparison. He says: "Perry & Co. have shown by their records that convict moulders produce, but *forty-seven per cent.* as much as citizen moulders." Then a free moulder must work for $1.19 a day to compete with convict labor.

It is easy to see that millions of dollars of extra profits lie back of the contract system. When those citizens who honestly believe the contract system to be the best for employing prison labor, study the matter closely, see its injustice and the various deceptive artifices employed by its special advocates to give a false impression of its beneficial operations, we believe they will join with true reformers in demanding its extirpation.

Steel Castings for Locomotive Work.

Since publishing our collection of letters from master mechanics in regard to the use of steel castings on locomotives, we have received the following from the general master mechanic of the Cleveland, Columbus, Cincinnati and Indianapolis Railroad:

"We have used crossheads, links and rocker-arms, made of cast steel, for the past four years, and, as yet, have never had a broken casting to replace. We find that steel castings cost 25 per cent. more than iron, and the labor of shaping about the same in each case, but much less than in the use of wrought iron. My experience has shown the wearing qualities of cast steel fully equal, if not better, than iron, and in the use of steel castings we have the advantage of light material with much greater strength and durability, and I consider it indispensable for the above purpose in locomotive use.

W. F. TURREFF,
Gen'l M. M.

Keeping Drawings Safe.

How do you keep your drawings? Supposing the shop burns down, what will you do? How will you fill your orders with the least delay? It is easy enough to order new lathes and planers. At present you can get them right off; but, suppose your plans are burned up slick and clean, then what will you do?

Before new plans can be worked up, your customers have got tired and rescinded their contracts. By the time you have got ready to fill orders, then you have no orders to fill. T. H. Dallett & Co., of Philadelphia, were burned out last July. They had formed the habit of keeping their most important plans (or rather a tracing of them) in the safe. They got up drawings in pencil, had tracings made from them, and blue prints from the tracings.

When the fire got loose, the tracings were in the safe. Drawings, patterns and tools went to ruin, but when the safe was opened there was a good set of tracings, and blue prints were made from them in short order.

The safe was small, and the tracings had to be rolled up. But now that firm is having a special safe made, with big drawers to put their plans in. This is a point for the trade; let them get the benefit of it, and not say, as a stock company manager did, "Well, it is a good thing, but we don't want to turn in a bill for a big safe; the stockholders would kick."

Making a Solid Road-Bed.

The western approach of the South Bridge, in Philadelphia, is nearly complete. In 1875 a stone approach, resting upon nine arches, was erected. In 1878 the whole fell down. It was caused by the failure of the foundation of one pier. The stones did not separate, owing to the quality of the cement, but fell in huge masses. A defective foundation had been built on spruce piles, 8″ in diameter at top. They spread out from east to west and let the masonry down. In rebuilding this pier, oak piles, 8″ diameter at the *small end*, were used. They were 40 feet long, and about 14″ at the butt.

The road-bed is covered with iron plates having a convex surface, like a bulged boiler plate. When laid in place, bulge up, these plates, which are about 30″ square, will carry a load of 80 tons per plate. The convex surface is then leveled up with Portland cement, and, to prevent water from leaking through to rust the plates, the whole is covered with asphalt, 1″ thick. Upon this is 4″ of concrete, which, in turn, supports the tram rails and paving blocks.

After the rails and blocks are set, instead of filling with sand, as in ordinary street work, Portland cement is mixed very thin, and poured over the paving stones, which are "Belgium blocks."

By the above means a solid road-bed is attained, and it must wear for many years with very little repair.

Gould's Automatic Rat Trap and Nail Feeding Works have rented the first floor of No. 207 South Canal street.—*Chicago Industrial World.*

Is this the same rat trap that Jay Gould brought to New York to exhibit at the fair, when he was a boy? Jay Gould has invented a great many traps since then, of larger capacity than the original, and it is due to his skill to say that they have generally worked pretty well. Perhaps the old trap will do as well for small game as any recent invention. Nobody but Gould himself can manufacture the traps he originates now.

"Hello! Tom; what is the matter with you this morning? You look like a condemned train robber, or a discharged Navy-yard hand. What ails you? Has Brother Richards been chalking you all over or have you eaten sauce *a la hog-nose drill?*"

"Now, look here, Mr. Hobart, be rather easy, or I shall explode. Here I've been trying more than two hours to grind up this arbor, and just look at it. You feel this floor shaking, don't you? Well, see the holes that emery-wheel makes. Every time the floor settles it gouges; every time the floor rises it leaves a high spot, and that arbor looks as if rabbits gnawed it out.

"Look at this center. I ground it up yesterday with that patent grinding device, and boss asked me if I was making a milling cutter or a fluted reamer. It feels almost like a grist-mill spindle, it is so rough."

"Poor lathe," you say. "Springs, does it? Well, let's see you find any lathe in America that won't spring when the floor is going up and down 120 times a minute. There's no use trying to do good work in a lathe unless you have something solid for it to stand on," and Tom went to the closet for a piece of waste. He got a big bunch, threw half of it on the bench, and used the rest.

HOBART.

The Clayton Combined Speeder and Pressure Governor.

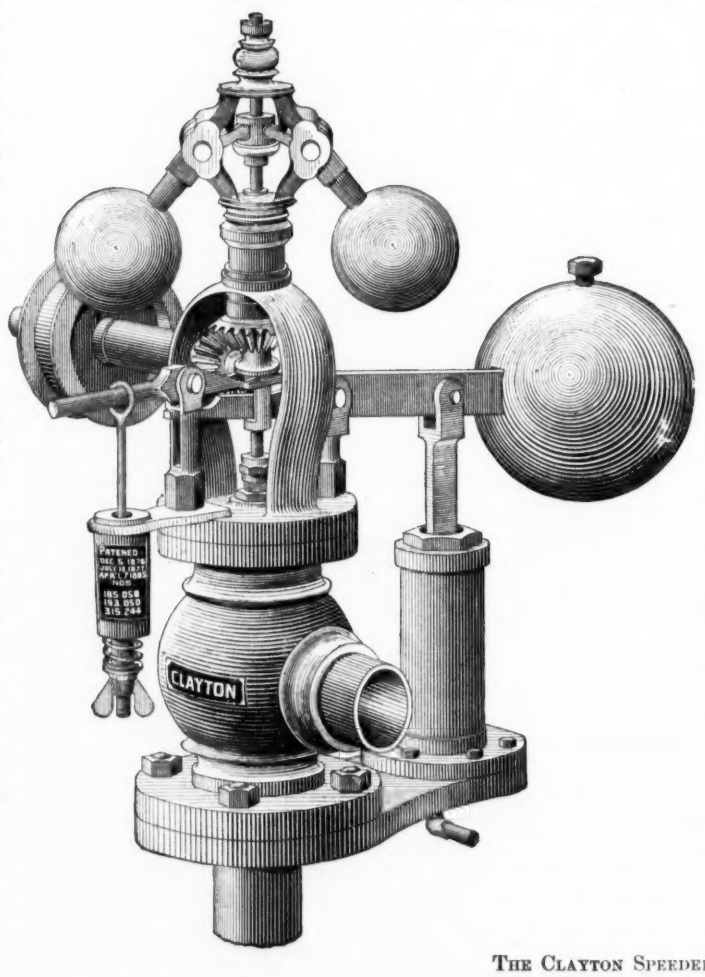
The above-named device, which we illustrate herewith, forms a most important factor in the economy of the Clayton Air Compressor.

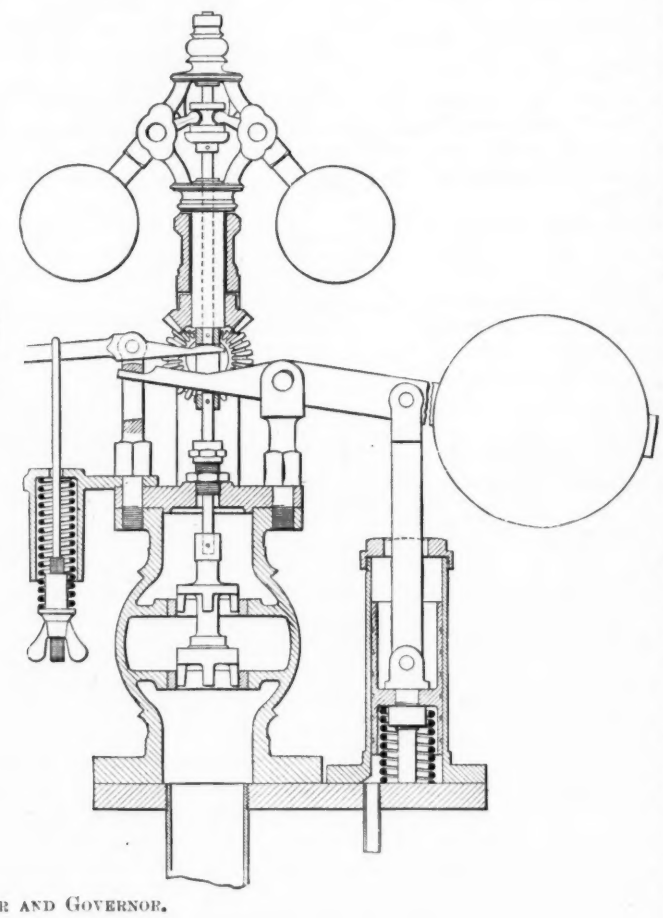
As seen in the engravings, which show both perspective and section, the device consists of an improved throttling governor, with slotted valve stem, through which passes a lever, actuated by the compressed air in a small cylinder, as shown in the sectional drawing.

If by any means, such as the bursting of a hose or pipe, the air pressure be greatly reduced and engine speed increases, it is controlled by the ball governor in the usual manner.

If the delivery of air should be stopped, the tendency of the engine will be to run slower, thus admitting more steam and driving the air pressure to an excessive figure. When this takes place, the piston rises in the small cylinder, shown under the large ball weight, causing the ball and lever to rise, engage the valve stem, and shut off steam until pressure is reduced to the desired figure.

The Clayton Air Compressor Company, 43 Dey Street, New York City, are the manufacturers.





THE CLAYTON SPEEDER AND GOVERNOR.

"I want to be a mechanical engineer," said a young man to a prominent engineer. That young man spent ten years in the business. He went to college; he attended technical schools; he took degrees and wrote half the alphabet after his name, but he was not an "M. E." He never would be one. It was not in him.

His schoolmate never saw even the walls of a technical school, yet the schoolmate became an "M E." in earnest. He was called to responsible positions, and filled them well.

A paragraph headed "Tempering Steel With Low Heat" is going the rounds of the press accredited to Herr A. Jarolinek, in *Dingler's Polytechnic Journal*. This writer is made to say: * * * "Thus, for example, that steel might anneal—be tempered—yellow, it has to be heated to 540 degrees. * * * The temper which the annealing color—yellow—indicates, can be obtained by exposing the hard steel for ten hours to 260 degrees of heat; in other words, by placing it in water rather above the boiling point."

We presume from the above that Herr Jarolinek has been visiting in the country where the old grangers have the idea that a scythe, or an axe, which is too hard to "stand" well, may be softened by placing it where the rays of the sun will fall upon it. Perhaps the cook told him that hot water drew the temper of her knives, or a carpenter swore the hot sunshine spoiled his hand saw. The wood-chopper always warms his axe in winter before putting it to work, but he don't trouble the temper, he only drives out the frost.

Herr Jorolinek had better try the other extreme when he tempers steel. Instead of putting it into water of 260 degrees, let him put it twice as long in water of 520°, and then write out the result.

In repairing a steam-pump, an off-hand test will answer very well.

Put the pump all together ready to go out of the shop, connect with steam and water, and avoid both pressure and suction in water-supply pipe as much as possible. Screw a pressure gauge to the water end and start the pump. After it gets limbered up a little, gradually close a valve in the delivery-pipe, and note the pressure. Work the pump up to its full power by closing the valve, and see if it leaks water by the piston. Watch the exhaust also and see if that is correct.

Divide the size of steam cylinder by size of water-cylinder, square the result and multiply the steam pressure by this product.

The pressure indicated by the water-pressure gauge should be about 25 per cent. less than the figures obtained. For instance: an old style Knowles pump with 10″ steam and 5″ water cylinders, 45 lbs. steam pressure, gave a pressure in the air-chamber of 130 lbs., and practically no slip of the water-piston. If the water-pressure does not come up to the above per cent. we must look for something too tight in cylinder or stuffing box.

We learn that Secretary Manning is not meeting with much success in receiving replies to his circular to manufacturers, asking particulars about cost of manufacturing, in detail, advantages for business, and other matters which are supposed to be kept private. It is given out that only two hundred replies have been received. The iron manufacturers have as yet contributed nothing of importance. The result is disappointing, as might have been foreseen.

Small buildings, commonly called "tenfooters," which are built of wood, and abound in every city and town, are now framed with bar and angle iron.

The frame iron is drilled, tapped and put together with bolts, rivets and set-screws. Corrugated iron siding is put on with screws, and when the interior is finished with wire lath and plaster, the building is fire-proof.

The Peoria (Ill.) Co-operative Coal Company is said to have success now within its grasp. The stockholders, fifty in number, have property valued at $6,000, and all of them now find employment in the mine. No one can work who is not a stockholder and also a Knight of Labor. Coal is being sent to market.

LETTERS FROM PRACTICAL MEN.

Cleaning Scrap Metal.

Editor American Machinist:

I was interested in the suggestion of "Kid" in your issue of August 22, of the use of a tumbling barrel for cleaning scrap iron of dirt and brass, knowing by the experience of a year and a half that such a practice is valuable. For heavy scrap such as burnt nails, nuts, washers, etc., use a tumbling barrel 30″ in diameter by 48″ long, and sixty-five revolutions per minute. The shell should be drilled with ¼″ holes 3″ apart each way, avoiding any slots or crakes as the nails will fall through.

Material to be cleaned should be thoroughly dry, and about four hours' run will sift all the dirt and rust through the holes and leave your scrap clean and bright. There will be no trouble in detecting brass, galvanized iron, or pieces brazed or tinned.

For light iron, such as barrel hoops, stove pipes or sheet iron, use a barrel 5′×6′ run at 500 feet per minute at the circumference. Iron should be cut to 5″×20″, or smaller, and holes in shell may be cored ½″×2″. Each barrel should be enclosed in a box or room nearly tight, with an exhaust fan on top to carry away the dust. IRVING.

"Rum and a Machinist."

Editor American Machinist:

Since reading in your issue of August 29th Hobart's description of the downfall of "John and Mary," under the expressive heading, "Rum and a Machinist," I have, in turning over in my mind some striking cases of which I have been cognizant, where intoxicants have been ruinous, thought of a scene on one of the public streets of Springfield, Mass., some thirty-five years ago, of which I was an eye-witness. A man and his wife were engaged in a drunken fight in a house near the shop where I was working, and, as the fight waxed hot they rushed out of doors each with a weapon, a broom or mop, and had it out on the street. Machinist? Mechanic? No. The couple had been married but a few years. The man was a well-to-do merchant, with a good business when married. His wife was the daughter of a wealthy citizen, who said that wine was indispensable at the wedding. The young husband got his first taste of the liquid ruin on his wedding-night. With him, as with many others, the appetite grew to be uncontrollable. The wife, thinking to shame him, stepped up to the bar of a fashionable drinking resort one night by the side of her dissolute husband, and, calling for brandy, drank it in company with the motly assemb'age which had come to be his nightly associates. This made matters worse, and both husband and wife became confirmed drunkards.

Why rum is any more "the enemy of the workingman," than of any other man, is not altogether clear to me, unless it be in the case of skilled mechanics, who no doubt do some of the clearest thinking of any class of men in every community, and need to have, to do their best, perfectly clear heads. More than thirty years ago I had a shopmate whose name was not Tom, and for that reason I will call him Tom. He was a good workman, royal good fellow, and in those days when prize fights were common, and the "manly art of self-defence" was popular, the fact that Tom, while one of the best-natured follows in the world, had been pushed into some rough and tumble fights where his prodigious strength and the quickness of a cat demonstrated his ability to not only "whip his man," but to whip and throw out of doors a whole room full of ordinary men, made his friendship much sought for, and with the frequent invitations to "take something". Tom got in the way of taking too much. He got drunk. His moderate-drinking friends were shocked at the idea that a man did not "know when to stop." Why a man could not "know when he had enough," they could not see! Tom kept on getting drunk though, in spite of all the expressions of disgust on the part of his friends, and professed to feel much abused by long lectures to which he listened, from men who did the same thing for which they blamed him; drank, but "knew when to stop," they themselves said, although they occasionally staggered under a load for which they had better have gone twice.

Suddenly, with little leave-taking, for no one cared what became of Tom, he gave up his job and went, no one knew where. Poor fellow, at a little past twenty years of age he was a most hopeless drunkard. A year or two later, the news came that he was dead. Of course, nobody could live long that way. My story is almost as bad as that of Hobart's, is it not? and no woman in it. It is not finished. Some twenty years had passed after Tom's supposed death, when his name was mentioned to me as that of a man whom I should have known from having been a resident of ——— in 185——. This conversation took place in one of the large cities of the east. I said "Yes, I knew Tom ——— well, poor fellow, he died a miserable death years ago."

"Not much," said my informant, "you go to the shops of the ——— R. R. Co., and ask for their foreman, and you will make up your mind that Tom don't need your sympathy."

I went, and soon found myself grasping the hand of my old friend, and looking into a pair of as clear eyes as one needs to see.

Said I, "Tom, your habits have changed." Said he, "Yes, I don't take a drop, not even beer. When I left ———, I made up my

mind to let the stuff alone. I came here and got a job. The time which would have been spent in drinking-places only for my reformation, I spent in trying to learn all that I could in connection with the work on which I was engaged. When I had been here about a year I was surprised by being offered the position of foreman. I took the place, and have been foreman here for over twenty years. Soon after my promotion, I married. I have a daughter eighteen years of age. I have a comfortable home, fully paid for, and quite a little bank account. I have enjoyed the society of my family, and of such people as I come in contact with, better than I ever enjoyed that of frequenters of drinking places where I formerly spent so much of my time. I feel that all which I have, and all that I am, are in consequence of my determination to stop drinking. There may be those who can drink moderately; I was not one of them, and as I look back for twenty years, it is surprising to think how few of the hundreds of drinking-men who were employed here when I began and for the next few years, are now living and in condition to do good work. Why, nearly all the old drinkers who used to urge me to go with them to drinking-resorts, and sneer at me because I would not, are dead, or no longer able to do good work; while among the total abstainers of the same age are some of my best men. If a man only knew when to stop—but, when so many go wrong, it seems to me that the only safe way is to let the stuff entirely alone."

In substance, this was what Tom said. Within a year I have had the pleasure of a call from himself and wife. That he might have controlled his appetite, and, as a moderate drinker, done equally as well, I am not ready to dispute, but, would he have done better? Is any man worse for taking the safe course?

S. W. GOODYEAR.

Balancing the Reciprocating Parts of Steam Engines.

Editor American Machinist:

At the time of sending my communication to the AMERICAN MACHINIST of August 15th, I was in blissful ignorance of the labors of Prof. Robinson in the same field. Since then I have seen his paper as published in your issues of November 5th and 12th, 1881, and will say here that in my investigations, carried on independently, I have arrived at identical conclusions, and, furthermore, the processes, even to the matter of diagrams, are almost identical.

In my previous article, I said: "That by extending the rod far enough a result could be obtained which would be equivalent to having the entire weight of the reciprocating parts at the crank pin, in which event the crank would be balanced in a vertical as well as a horizontal position, and also during its entire revolution." But I proposed this rod as a practical one, and not an impracticable attempt to realize theoretical considerations.

It appears that a good many of your correspondents consider that that part of the connecting-rod which is centrifugal in effect, does not have the same effect in modifying the pressure on the crank-pin that the other reciprocating parts have. For instance, Mr. Williams, in his article of June 6th, says: "The best general balance is secured when the counterweight equals one-half the weight of the reciprocating parts, increased by that portion of the connecting-rod which may be considered as centrifugal in effect." This would imply that the connecting-rod was not included in the reciprocating parts, for if it were, it would be taking the centrifugal part one and one-half times. If the rod is included the proper wording of it would be: that portion of the connecting-rod which may be considered as centrifugal in effect, increased by one-half of the remainder of the reciprocating parts.

But Prof. Sweet states the case concisely when he says that if the rod were prolonged so that the result would be equivalent to having the entire weight of the reciprocating parts at the crank pin, "then there would remain no element in the reciprocating parts to equalize the pressure on the crank-pin."

He illustrates the case by supposing the weight "made into a round disk and hung on the crank, and the impulse from the steam communicated to this disk by parts having no weight whatever."

As the illustration fits exactly what I was at when I wrote my previous article, we will take it as it stands, and endeavor to show that it does have such an effect together with balancing the engine during its entire revolution.

In the accompanying diagram the large circle represents the crank-pin circle, and *A*, *B*, *C*, *E* and D represent successive positions of the crank-pin, with the weight hung upon it. As the pin revolves around the center *O* the centrifugal force of the weight acts upon the pin in a radial line. Hence in the position *A* it is acting in the direction *O A* towards *X*, but in this position the steam is acting in a contrary direction *X A* towards *O*, and consequently they act to neutralize each other.

If now we suppose the centrifugal force to be one-half the steam pressure, then will the resultant force upon the pin be one-half what it would be if there were no weight upon the pin. In the position *B* the steam pressure will resolve itself into two components, one acting radially upon the main bearing, and the other acting tangentially to cause rotation. If we suppose the connecting-rod to have no sensible angularity, and draw *Bs*, representing the steam pressure, then will *B h* and *B p* represent the tangential and radial pressures. And further, if we suppose the steam pressure to remain constant, and lay off on *O A* the steam pressure *O t* and on *O B* lay off *O m* equal to *B p*, and for each position of the crank lay off the corresponding radial pressures and join the points, then we will have the circles *O t m* and *O i*, representing the pressures toward and from the center. If we lay off the centrifugal pressure *O f*, equal one-half *O A*, and through this point draw the circle *f n k*, then will this circle represent the centrifugal force for every position of the crank, and the distance between this circle and the circles of radial pressures, represent the resultant pressure upon the pin.

Thus for the position *A* it will be *f t*, for *B* it is *v m*, and at *C* the opposing pressures neutralize each other, and there only remains the tangential pressure on the pin. At *E* the centrifugal force acts in full upon the pin. At *D* the steam pressure and centrifugal force act in the same direction. But in practice the steam pressure at this point is very slight, in fact, compression has already set in enough to overcome the steam pressure, and consequently acts in a direction contrary to the centrifugal force.

There is one other question about which there seems to be a very general misapprehension. It is, What part of the connecting-rod is centrifugal in effect? I see it repeatedly stated that the calculation is to be taken from the *center of gravity*. Such is not the case. The true point is the *center of oscillation or percussion*. Thus, in a uniform rod two-thirds of it is centrifugal and not one-half as is commonly stated. Referring again to the diagram, suppose *X F w* to represent a uniform overhung rod, hung at *X* in the crosshead. As the rod swings from *E* to *F*, if it is desirable to have the entire momentum delivered on the pin so that no tremble will be felt in the rod and no effect produced on the crosshead at *X*, then must the overhang *F w* be equal to one-half of the length *F X*. In a tapered rod much more than two-thirds is centrifugal.

To find the true amount of rod which is centrifugal, first find the center of oscillation and the extreme distance through which it vibrates vertically; then find the centrifugal force which a weight equal to the connecting-rod would exert when revolving in a circle whose diameter is equal to its vertical vibration; reduce this to a weight which would give an equal centrifugal force when revolving in the crank-pin circle, and the result will be the weight in pounds of the connecting-rod which is centrifugal.

To find the center of oscillation, let

w, w', w'', etc. = weight of successive sections of the rod.

a, a', a'', etc. = the distance of their center of gravity from the crosshead pin.

c = center of oscillation.

Then will $$c = \frac{a^2 w + a'^2 w' + a''^2 w + \text{etc.}}{a\ w + a'\ w + a''\ w + \text{etc.}}$$

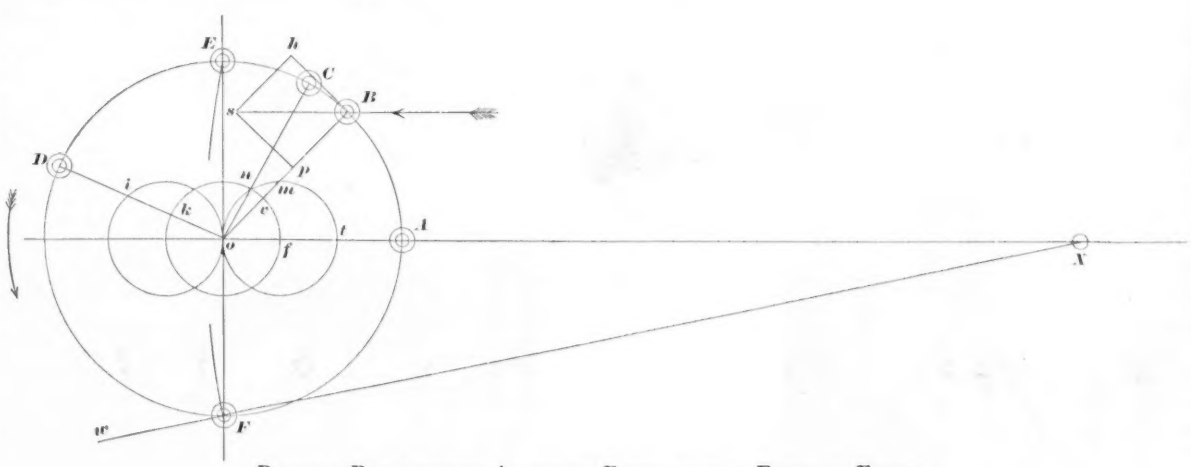


DIAGRAM REPRESENTING ACTION OF RECIPROCATING PARTS OF ENGINES.

The greater number of parts into which the rod is divided the more accurate will be the result.

Prof. Robinson says: "In practice, the crosshead, piston and rod should be designed first, and reduced to the minimum in weight, then the pitman is to receive the whole addition mass necessarily added to gain the desired weight of 'heavy reciprocating parts.'" To this I would add that the connecting-rod be so designed that the *center of oscillation be at the crank-pin.* This, of course, will leave the weight of the other reciprocating parts partially unbalanced.

As a further refinement for very high speeds it might be desirable to extend the center of oscillation a little beyond the crank-pin, at the expense of tremble in the rod and jar on the crosshead, though this would still be less than it is now in ordinary practice. In this event it would be necessary to increase the counterweight accordingly.

I cannot urge too strongly the desirability of using the extra weight in the connecting-rod instead of the piston and crosshead, as by this means I believe that we can obtain much higher speeds than at present.

If proper attention is paid to these details and to steam pressures, I believe it perfectly practicable to attain a piston-speed of from 1,500 to 1,800 feet per minute, and if called upon to design such an engine should not hesitate an instant on the score of speed.

C. L. REDFIELD.

Chalk in the Shop.

Editor American Machinist:

I notice an article in your paper from the pen of Frank Richards, in which he says that he would like to see chalk teetotally banished from the machine shop. I think he will never live to see that day. A piece of chalk may be a foolish thing to talk about, but it is a very important thing. Every well-regulated shop ought to have a good supply of it, and I always see that every lathe and work-bench have all that is wanted of it. What is better than a piece of chalk to illustrate your wants, by making a rough sketch to show your blacksmith, or in describing a lost pattern to your boss moulder, or to your casting cleaner when looking for a stray casting, or when in the pattern loft rummaging among a lot of old patterns by marking those that are not in use and those that are for repair jobs, and marking the name on those that belong to other parties, so that we can find them when they call for them? Yes, chalk is a very important thing, and I feel lost when I don't have a lump in my pocket. Mr. Richards asks, if he was cast on a desolate island, and his chest, containing his Haswell, Nystrom and Trautwine, was lost, what would he do? I think, if he had a piece of chalk and a good jack-knife in his pocket, he would be more acceptable to the natives. Don't think that, because I have taken up the cudgel in defence of the use of chalk in a machine shop, that I ignore perfect drawings. Far from it. Correct drawings for all kinds of new work are very essential. Mr. Richards says that he knows lots of things can be done with chalk, but none of them are done well. Probably they are done well enough. The machinist is satisfied with his chalk figures on the floor when he wants to find the correct gear for cutting the screw he may want. He says that it is almost hopeless to try and make a good workman of the man who is handy with the chalk. In this I think he is wrong. The man that is handy with the chalk is generally no slouch. Thos. Nast has made a small fortune by being handy with the chalk. If a man has got anything in him, chalk will bring it out.

BENJ. F. HETHERINGTON.

Indianapolis, Ind.

Marine Engine Management—Examination Questions.

Editor American Machinist:

Why is it that there is so little literature relating to the marine engine? I do not complain that there is too much relating to the locomotive and stationary engine, but that there is too little relating to the marine engine. Few men except those engaged in handling marine engines know of the difficulties to be overcome as compared to engines ashore. To illustrate, conceive an engine of from 2,000 to 10,000 horse-power, on an egg-shell, as it were, for a foundation. The consequence is that one of the permanent fixtures of the engine-room is a regular system of water pipes for the main bearings, and spray pipes for the crank-pins.

Hot journals, broken shafts and crank-pins are mainly due to weakness of the engine foundation—that is, the hull. A potent factor in this connection is the judgment displayed in loading the vessel. It is practically impossible to load a steamship with general cargo twice so that the strain on the journals will be the same in each case. An instance came to the writer's knowledge when in a vessel running between Galveston and New York. The main bearings wore down $1\frac{5}{8}$ inch in a three days' run, and during that time three stops had to be made to slip up the crosshead bearings to keep the piston from striking the bottom cylinder head. Finally, they were compelled to put into Charleston and raise the shaft to make the run home. This is only one of the many things that marine engineers have to contend with, and a few of the plans employed for getting around difficulties would be interesting and instructive reading.

I have read the questions in the AMERICAN MACHINIST for engineers' examination, by Mr. Baldwin, and also those by Mr. Hobart. According to my ideas, the questions that should be asked will depend upon the position to be filled. If I wanted to hire a first-

class foreman or engineer (enginist, as Prof. Sweet has termed him) for a small engine and boiler, I should think Mr. Hobart's questions about right. But if the position was one that required higher talent than to keep the engine oiled and plenty of water in the boiler, such talent as would be required in a large plant, when additions, alterations and repairs were required, the engineer having assistants, then I think Mr. Baldwin's questions would be the ones. Some of your correspondents object to his questions on the ground that one to answer them must be possessed of a high mathematical education. With the exception of five of these questions, they all ought to be answered by any competent engineer with a fair knowledge of arithmetic. For these five the examiner must have allowed the candidates to turn to some engineering work, as, for instance, to find the temperature and volume of steam, and for a table of hyperbolic logarithms to compute the mean effective pressure of steam at a given initial pressure and cut-off. Without some such reference, they could do nothing with these five questions, beyond stating the method they would pursue in answering them, which, I presume was all that was required; that is, to see if the candidates were familiar with the principles involved.

C. S.

I am of the opinion that a draftsman who can also work at the trade, has a decided advantage over one who cannot. He will be apt to keep clear of impracticable constructions, and will not be so likely to be bulldozed by workmen who will declare that such a thing cannot be done, if he can take hold of it and do it himself. I consider a draftsmen should see everything ahead, to make his work commercially, as well as mechanically successful. He should know how his forgings should be done, how his patterns should be made and how they had best be moulded, and how the turning and other machine work and fitting should be done to the best advantage, and so be entirely master of the situation. Where the dividing line, if such there be, between the draftsman and the mechanical engineer would be found, I confess myself unable to tell.

WM. T. SILVER.

A Query About Jigs.—Thickness of Cylinders.—Draftsmen's Society.

Editor American Machinist:

I wish to make a few comments on some articles which have appeared lately in your paper. I was very much interested in Mr. Goodyear's account of using jigs, but just where I would like to have him give his experience, he was silent. How is the best way, with ordinary tools, to drill holes in jigs *exactly* where you want them? By this I mean so exact, that if a jig is turned over or reversed on another one, close fitting plugs will slide through the holes of both.

Mr. Meyer's article on the thickness of steam cylinders caused me to compare notes. I have been using a rule for some years, with good results, in practice, though my notes not being handy, I cannot tell its author. It comes closer to the thicknesses given in practice, than the rules referred to in the article—thus:

$$T = .0001, D \times P \times .225 \sqrt{D}.$$

or for a 16″ cylinder, with 120 lbs. pressure $(16 \times 120 \times .0001) \times .225 \sqrt{16} = 1.092$, or a little over one inch thick.

In regard to the proposed association of draftsmen, I think it would be a good thing. Draftsmen are more isolated than almost any other class of men, and I certainly think that an interchange of ideas, leading towards uniformity in practice, would be very desirable. Although running my own shop, I still make some of my own drawings, and I always feel that a set of drawings of an engine or other machine which has successfully passed through the ordeal of shop construction, and come out all right, without any mistakes or misfits, is something to be proud of.

Change of Pitch in Locomotive Whistles and Bells.

Editor American Machinst:

Your quotation from *Asbury Park Journal*, page 4, No. 36, brings to my mind the phenomenon of the change in tone of the bell and whistle at the moment of passing a train. This is more noticeable when one is on a train also in motion in the opposite direction.

The explanation seems to be that when a sound-giving object is approaching, each wave has successively a shorter distance to travel to reach the ear, thus apparently raising the pitch of the sound above its actual pitch; and the converse, when the object is receding the pitch is lowered.

This amounts, at the virtual velocity of two meeting trains, to something near a semitone in the pitch of a bell.

I have often noticed this when riding, and have spoken of it to others, but have never seen any notice of it in print.

JOSEPH P. NOYES.

It is said that all the steel-rail mills have orders enough to keep them running for the remainder of this year.

Modern Locomotive Construction.

BY J. G. A. MEYER.

TENTH PAPER.

SLIDE-VALVES, AND MOVEMENT OF SLIDE-VALVES.

Slide-valves are sometimes made of brass, but generally of cast iron. Cast-iron slide-valves are more durable than brass valves, but the latter do not wear the valve's seat as quickly as the cast-iron valves.

The ordinary form of slide-valve, such as is generally used in locomotives, is shown in Figs. 26 and 27. Fig. 26 represents a cross-section of the valve; one-half of Fig. 27 shows a section lengthwise of the valve, and the other half an outside view of the same. The thickness of metal at *a* is generally made 1 in., and at *b* about ¼ in. The sides *c d e f* are extended upward until they become flush with the top *b* of the valve; in some cases these sides are extended a little beyond the top of the valve. This has been done for the following practical reasons: In the first place, a large surface is produced against which the valve yoke is to bear. Secondly, this form of valve can be laid on its back, and thus speedily and conveniently secured to the planer, when the valve face is to be planed; this is a matter of no small importance in a large locomotive establishment where a number of valves have to be planed daily. The recesses *g g* shown in Fig. 26 are simply for the purpose of making the valve as light as possible. Some master mechanics object to these recesses, because they believe that they will hold the oil (which is usually admitted through the top of the steam-chest), and prevent the oil from falling upon the valve-seat, and thus not find its way into the cylinder. For this reason a valve has been adopted having a form as shown in Fig. 28. This form of valve, although used on some roads, has not been favorably received on other roads, because it takes up too much room in height, and besides it is an inconvenient casting to fasten to the planer when the face is to be planed or replaned. The writer would recommend the adoption of a valve having a form as shown in Fig. 26, and believes that the fear of the recesses *g g* preventing the oil from flowing into the cylinder is groundless, and that the constant flow of steam into the chest will not allow the oil to lay still on any part of the valve.

The duty of the slide-valve is to control the flow of steam into and out of the cylinder, that is, the valve (as its name implies) slides backward and forward on the valve-seat, thus opening and closing the steam ports at proper times. Whether it will perform this duty or not, depends upon form and motion of the valve.

Fig. 29 shows a complete locomotive valve gear; the names of the different pieces of the mechanism are plainly marked on the drawing, so that here any further definitions of these pieces will be unnecessary.

To construct a slide-valve and assign to it the proper motion, such as shown in Fig. 29 may seem to be a difficult subject for solution; and so it would be, if, right in the beginning we do not—wheresoever we can—throw out of consideration all such pieces of mechanism as have a complicating influence upon the motion of the valve. Hence it is of the utmost importance first to reduce this subject to its simplest form. It will be noticed that the operation of the valve is controlled by two eccentrics: one eccentric is used for the forward motion and the other for the backward motion of the engine. Here we may simplify our subject by leaving out of consideration the backward eccentric, because when the valve is made to accomplish the desired results with one eccentric its form will not have to be changed when the other eccentric is added. But leaving the backward eccentric out of the question, we may also leave the link out of consideration, because the link only serves to connect the two eccentric-rods so as to enable the engineer to put wholly or partly into gear one or the other eccentric. The lifting-shaft is simply used for moving the link up or down as the case may be; and since the link has been thrown out of consideration we may treat the lifting shaft likewise. The rocker is simply used for the purpose of connecting the eccentric-rod to the valve-rod, and although it affects the position of the eccentrics, and in some cases the travel of the slide-valve, it will not affect the laws relating to the construction of the valve, and therefore we also throw this out of consideration.

Reducing our subject as described, and connecting the eccentric-rod directly to valve stem, we obtain a simple arrangement, Fig. 30, such as is often used in stationary engines; of course, in this arrangement we must assume that the driving axle of the locomotive is represented by the crank-shaft *C*, and the eccentric placed on the end of the shaft as shown. In this arrangement, simple as it is, a feature exists which has a somewhat complicating influence upon the motion of the valve, and therefore will interfere with the simplicity of our study of the laws relating to the form of the valve. The feature alluded to is the angle that the eccentric-rod makes with the center line, *A B*. This angle varies during the travel of the valve, and consequently the motion of the valve will be slower during one half of the travel than during the other half. Thus, for instance: Let the line *A B*,

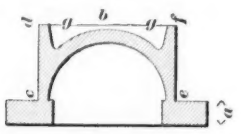


Fig. 26

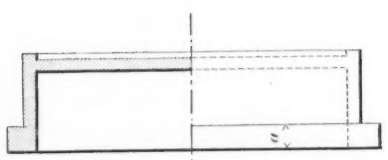


Fig. 27

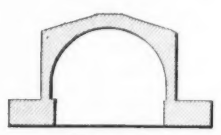


Fig. 28

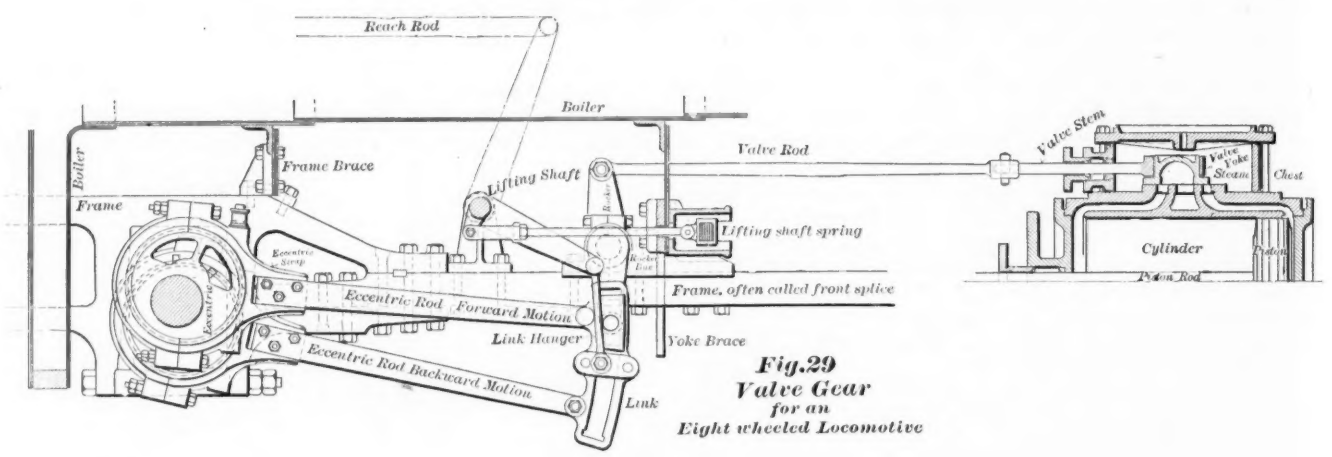


Fig. 29
Valve Gear
for an
Eight wheeled Locomotive

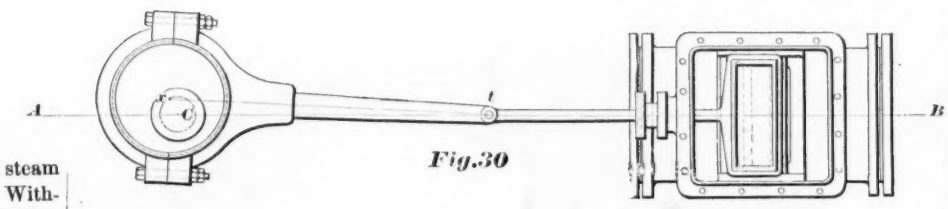


Fig. 30

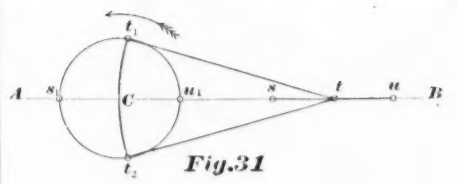


Fig. 31

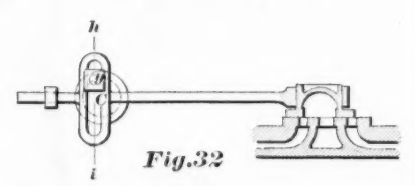


Fig. 32

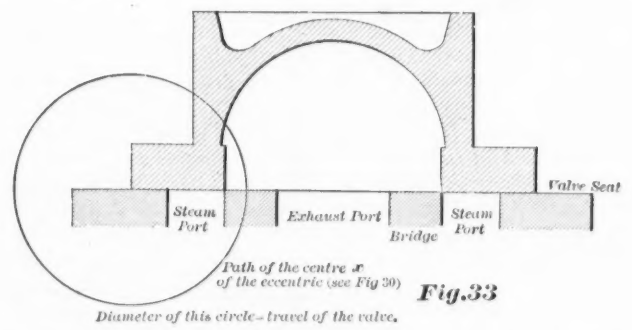

Valve Seat
Steam Port
Exhaust Port
Bridge
Steam Port
Path of the centre of the eccentric (see Fig 30)
Diameter of this circle = travel of the valve.

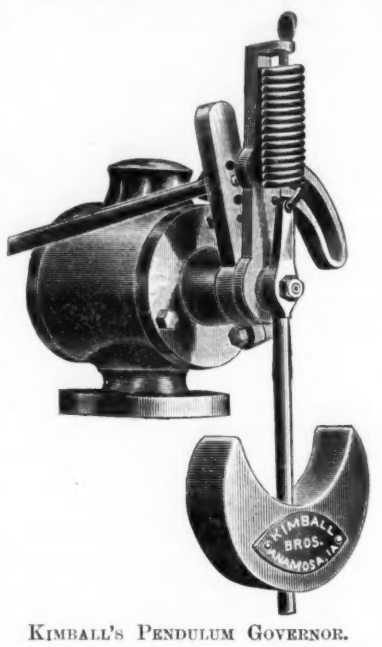
Fig. 33

in Fig. 31, represent the line $A\ B$, shown in Fig. 30. The circle $s_1\ t_1\ u_1$, Fig. 31, will represent, in an exaggerated manner, the path of the center x of the eccentric shown in Fig. 30, and, lastly, the distance from the center x to the center t of the eccentric-rod pin in Fig. 30, is represented by the line $t_1\ t$, in Fig. 31. Now, referring only to Fig. 31, when the valve stands in an extreme position of its travel, the center of the eccentric-rod pin will be at u, the center of the eccentric will be at u_1, and the center line of the eccentric-rod will lie in the line $A\ B$. Again, when the valve stands in the other extreme position of its travel, the center of the eccentric rod pin will be at s, the center of the eccentric will be at s_1, and the center line of the eccentric rod will lie in the line $A\ B$. When the slide-valve stands central, that is midway between the extreme ends of its travel, the center of the eccentric rod pin will be at t, exactly midway between the points s and u.

From the point t as a center, and with a radius equal to the distance Ct, describe an arc; this arc will intersect the circumference $s_1\ t_1\ u_1$ in the points t_1 and t_2. Join the points t and t_1 by a straight line, also draw a straight line from the point t to the point t_2; then the straight line $t\ t_1$, and $t\ t_2$ will represent the center of the eccentric-rod when the valve stands in a midway position of its travel, the point t will be the center of the eccentric-rod pin, and the point t_1, or the point t_2 will be the center of the eccentric. Assume that the shaft is turning in the direction indicated by the arrow. When the eccentric-rod pin has traveled from u to t equal to half the travel, the slide-valve has also completed one-half of its travel, and the center of the eccentric has traveled through the arc $u_1\ t_1$. Again, during the time that the eccentric-rod pin travels from t to s, equal to half the travel, the center of the eccentric will travel through the arc $t_1\ s_1$. But now notice the difference of length of the two arcs $t_1\ s_1$ and $t_1\ u_1$; this plainly shows that the eccentric-rod pin will travel slower from u to t than from t to s, and consequently the travel of the valve will be affected likewise. Or, we may say, that the angle formed by the lines $t\ t_1$, and $A\ B$ destroys the symmetry of the valve motion. Now, in the study of the laws relating to the motion of the valve and the duties it has to perform, such a motion will complicate matters, and will prevent us from tracing the action of the valve so readily as when both halves of the travel are described in equal times, and therefore the reader will perceive the necessity of changing the valve gear to one which will give the valve a perfectly symmetrical motion.

In the first place, it will be easily seen that the longer we make the eccentric-rod—leaving the travel of the valve the same—the smaller will be the angle between the line $t\ t$ (which represents the center of eccentric-rod), and the line $A\ B$, and consequently the times in which the halves of the travel of the valve are described will be nearer equal, and when we assume the eccentric-rod to be of an infinite length the angle will vanish and each half of the travel of the valve will be described in equal times, and the motion will be symmetrical; in fact, the valve will have precisely the same motion as that obtained with a valve gear, as shown in Fig. 32, to which we shall now call attention.

In this figure, in place of using an eccentric-rod, the valve-stem is lengthened, and to its end a slotted crosshead is forged. The eccentric has also been dispensed with, and in its place a pin y fastened into the end of the crank-shaft has been adopted. The distance between the center C of the crank-shaft and the center of the pin y must always be equal to the distance between the center C and the center x of the eccentric shown in Fig. 30. This distance from C to x is called the eccentricity of the eccentric, and is equal to one-half of the throw, or in other words the throw of an eccentric is equal to twice its eccentricity. In this particular case, as shown in Fig. 30, the throw is equal to the travel of the valve; by the travel of the valve is meant the distance between the extreme points of its motion. In locomotives, the travel of the valve is not always equal to the throw of the eccentric, the difference being due to the influence of the link, and often to the unequal lengths of the rocker-arms.

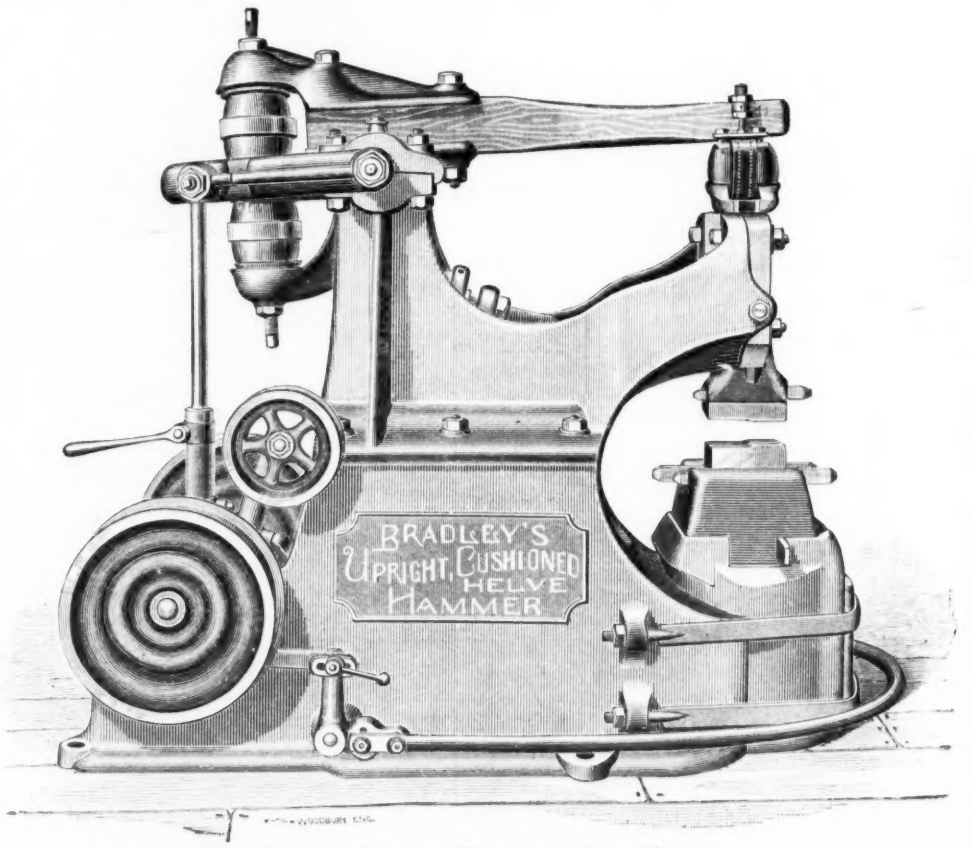


KIMBALL'S PENDULUM GOVERNOR.

Now, turning our attention to Fig. 32 we notice that by substituting for the eccentric a pin y in the end of the crank-shaft, we really adopt a crank, and this we can do without affecting the correctness of the reasoning relating to the movement of the valve, because the action of the eccentric is precisely the same as that of a crank whose length is equal to half the throw; the only reason why eccentrics are adopted, is that they are more convenient to use, in fact, cranks in some cases cannot be used, the peculiar construction of the machine preventing; in no case is an eccentric adopted because a different motion to that due to a crank is desired.

We have drawn particular attention to this fact, because some mechanics (a good many of them) have a misty notion of the action of an eccentric.

As the shaft revolves (see Fig. 32) the pin in the end of the shaft will move in the slot of valve-stem's crosshead, and thus, always allowing the center line of the valve-stem to coincide with the line $A\ B$. It must also be plain that as the shaft revolves the center of the pin will describe a circle, and it is the circumference of this circle that will enter into the solutions of the following problems. Once more, the reader will easily perceive that the length of the valve-stem will in no wise affect the motion of the valve, hence we may leave this also out of consideration, and place the circumference of the circle which represents the path of the pin y, on the end of the slide-valve, as shown in Fig. 33. Here then we notice that our original subject, that of finding the proper motion and form of a valve, a subject in which all the different pieces of mechanism, as shown in Fig. 29, had entered, has been reduced and simplified to that having only the pieces of mechanism as shown in Fig. 33.



THE BRADLEY UPRIGHT CUSHIONED HELVE HAMMER.

Kimball's Pendulum Governor.

In this governor the pendulum shown is arranged to beat at the speed which it is desired that the engine run. The governor receives its motion by a rod attached to the eccentric-rod and the pin in the arm, which gives the sleeve and outside valve a backward and forward motion. Inside this valve is another valve with its stem through the sleeve, and on this stem hangs the pendulum. The spring attached to the pendulum and the arm holds them to move together until the speed of the engine is faster than the regular time of the pendulum, then the pendulum will swing out past the arm and cut off steam, so that just enough steam is let into the cylinder to run the engine at the regular speed of the pendulum, and that is let in at the beginning of the stroke, thus making an automatic cut-off, admitting steam at the beginning of the stroke and cutting off the supply at the right time to correspond with the load and steam pressure.

It will be understood that, the pendulum vibrating in equal times, it does not depend upon the speed of the engine for regulation; being connected direct to the eccentric-rod there is no danger from slipping or breaking belts. By moving the weight up or down on the pendulum-rod the time of vibration is varied, thus changing the speed of the engine at will. It can be readily attached to almost any engine without alteration of parts and in a very short time, it being designed with a view to permit its use in the alteration of old engines that do not operate satisfactorily as well as for new engines specially arranged for it.

W. H. Robertson, 28 South Canal street, Chicago, Ill., is general agent for the sale of these governors.

The Bradley Upright Cushioned Helve Hammer.

The engraving represents this hammer, as perfected by the manufacturers, Bradley & Co., Syracuse, N. Y. It is adapted for use on all kinds of forgings in general jobbing shops, in railroad-car works, carriage factories, etc., including all kinds of die work.

The hammer is operated by an eccentric at the rear, connected by a pitman to the saddle or oscillator, which carries the helve; to this helve the hammer head is attached.

By the use of the rubber cushion employed with these hammers, the force of the blow is several times increased, but at the same time a degree of elasticity is maintained that prevents danger from breakage, and thoroughly cushions the jar, which is not perceptible in the working. By this means the blow is made to imitate the blow of a hand hammer; the hammer-head gets away from the work almost instantly after striking the blow, thus avoiding chilling the work.

Every working part of these hammers is in full view of the operator, and the whole is of very simple construction. A friction sleeve on the pitman at the rear of the hammer permits the length of stroke to be instantly adjusted—a matter of a good deal of importance in doing a variety of work differing in size.

The arrangement is such that the keys holding the upper and lower dies are removed as well as driven in from the front. By the use of the friction sleeve, previously referred to, the opening or distance between the dies while at rest may be varied from actual contact up to six or seven inches in the smaller sizes, and twelve to fifteen inches on the larger sizes. In making these changes, no other parts require adjusting; adjusting the stroke adjusts all other working parts.

These hammers are made throughout of the best material, and an important claim made for them is that they consume the minimum of power to operate. Several of the improved kind here shown have been in operation for more than a year.

The new iron tugboat S. A. McCaulley, which is receiving its finishing touches at the Pennsylvania Company's wharf, in Philadelphia, is a piece of work which marks a step in the right direction.

Iron towage is new to the Delaware; but, as the towage of the future, it is recognized by all.

This boat cost about $24,000. The cost of a like wooden boat would be about $10,000, but the average life of an iron boat is much the greater.

Timbers ten inches apart from amidships forward, the S. A. McCaulley is very strong. The first time her engine was started, it ran for three hours without heating a bearing or starting a single bolt. She will be tested at sea September 20.

A Washington dispatch says: "At the Navy yard here it is said an order has been made for new and additional machinery, and that it is intended the yard shall be fitted up with a large capacity. Congress is to be asked to appropriate this winter a sum much larger than has been usual in years past, so that many men may be employed, and much new and old work turned out."

E. W. Thompson, of Thomasville, Ga., who has considerable experience in making cotton-seed oil, has taken the position of superintendent of the Oliver Oil Company, Charlotte, N. C. Mr. Thompson read an interesting paper on the making of cotton-seed oil at the Atlantic City meeting of the Mechanical Engineers.

The maximum speed of a piston may be found, near enough for all practical purposes, by multiplying the speed in feet per minute by $\frac{11}{7}$.

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NEW YORK, SEPTEMBER 26, 1885.

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Facts Regarding the Prison Contract System.

We devote a large amount of space this week to a comparison of the official records of New York State prison revenues and expenditures, as presented in the annual reports of the Superintendent of Prisons and the Comptroller. The comparison shows that the people have been systematically beguiled by fictitious figures of "surplus earnings" under the private contract system, thus conveying the impression that the prison revenues are greater than the expenditures. By a clumsy manipulation of figures (we cannot say ingenious), in the 186-page report of Superintendent Baker, the total expenditures for the year in each of the three prisons are made to appear considerably less than they are shown to be by the Comptroller's financial statement. The "surplus" is figured up by leaving out of the statements of total expenses several thousand dollars paid for prison supplies, ordinary repairs, water and instruction of convicts; also by leaving out the general expenses of the prisons not chargeable to any of the three prisons in detail.

The alleged "surplus" is further swelled by including the earnings of convicts (at 60 cents a day) in doing prison repair work in table of earnings, and excluding the same from table of expenses in making up totals. The result thus ciphered out is paraded as an almost irresistible argument in favor of maintaining the private contract system of employing convict labor. It has been widely circulated by the press, and supplemented by alleged net earnings of Sing Sing Prison every month. As the masses of people have very little time or inclination to study official financial statements, they generally accept as correct what is repeatedly published in the newspapers without denial. We have nowhere seen in print a comparison of prison finances, as given by the Comptroller and Superintendent of Prisons, therefore have surrendered much of our space this week to let the facts be known.

With a law upon the statute-books that no more prison contracts shall be entered upon in the State of New York, the chief officer of prisons pleads earnestly with the Legislature to continue the contract system, and points to his financial exhibit to fortify his declaration that the prisons are self-sustaining under that system, but were not so before it was adopted. What shall we think of a system of prison labor that required such a perverted use of figures to commend it to public favor? We commend this question to those who have become convinced in favor of the contract system by the widespread publication of supposed surplus earnings. Let them study the facts, and base their opinions thereon. Deduction from false statements should be quickly cast aside.

The prison contract system is a burden upon free mechanics. It is an injustice to ask them to compete with the labor of convicts at 30 to 56 cents a day. Besides this extraordinary cheap labor, the contractors have free shop rent, free machinery, free wharfage, free insurance, free office furniture, and free repairs. In dull times, how can manufacturers or mechanics compete equally with establishments so favored? While production is being restricted by many manufacturers because the market is overstocked, the prison manufacturers cannot shut down or curtail their production without paying for labor just the same. Their contracts call for the labor of a definite number of convicts, and if furnished by the prison authorities they use them. Thus prison-made goods are now being stocked in warehouses to be thrown upon the market in the future.

The most extensive prison contract is for making stoves, and it was entered upon to defeat free moulders in a contest over the wages question. The extra profits of prison contracts are great enough to make a determined fight for their perpetuation. A literary bureau has been started to keep the benificent results of the contract system continually before the people. Persistent efforts are made to convince the public that convicts must either work for contractors, manufacture goods on State account, or be supported in idleness. This is a flimsy position from which to argue the question. Convicts can be employed upon public works as they are in some foreign countries, with good results, both financially and in a reformatory way. Sing Sing prison was originally built by convicts, and a railroad was built in the northern part of the State by convicts. Roads and public structures would give employment to all the prisoners. It has been proposed to deepen the canals and widen the locks so as to increase their capacity. Convicts could well be employed in this work.

We are pleased to announce that James F. Hobart, who is well known to our readers, has made a regular engagement with the AMERICAN MACHINIST, and will represent this journal as a special correspondent. He will devote his time to visiting shops in different localities, and making notes of mechanical matters as he sees them. We are sure that Mr. Hobart will be pleasantly received in his travels, and that he will lay before our readers many interesting notes.

More Business Activity.

Every day we hear reports of the starting of idle mills, shops and factories. Business has been badly depressed but there is something more than the perennial "better feeling" observable just now. Manufactories are starting up because they have orders to fill. In most cases profits are small, but they are large enough to make it more desirable to run the establishments than to remain idle, and keep customers away. In parts of New England, cotton mills are busier than they have been for months before. Rolling mills are resuming work in many places, but the iron trade needs a strong impetus to get into activity again. Rails are in better demand, and there has been a stiffening up in price. Danbury recently made the largest week's shipment of hats on record. The hosiery mills in Philadelphia are working full time with a full complement of hands and the demand for goods is said to be heavier than it has been for two years before. Transportation lines are having an increase of freight and there are daily stronger indications of greater business activity.

Manufacturers and the Tariff.

A large convention was recently held in Providence, which even the New York *Times* refers to as "an important convention of Rhode Island manufacturers and business men." There have been so many false representations in certain newspapers about what manufacturers desire Congress to do about the tariff, that this convention was called to give authoritative expression to the views of the manufacturers of that State. They unanimously adopted a resolution against any tariff tinkering by the new Congress that meets next December. The same views are undoubtedly shared by the manufacturers of all the other States.

But the *Times* in an editorial tells them they don't know what is for their best interests, and that they might as well commence to throw overboard some of their advantages over foreign rivals because their interests are certain to be raided. It says:

"If they think they have profited in the past, and can profit in the future by protection, they ought to see that they cannot maintain as high protection as they have heretofore had, and must make substantial concessions to save what they may think they really need."

For whom does the *Times* desire these concessions? Not for the masses of people in this country but for foreign manufacturers and importers, who are at the bottom of all the agitation against protection. The importers are mostly in New York city, and if those who import nine-tenths of the goods at this port could be gathered together they could all be placed on a Fulton ferry boat without overcrowding. Tens of thousands of American manufacturers and their millions of workmen are told that they have too many advantages in competition, and that they must give up some of their benefits to appease the demands of this handful of men. Even absolute free trade would not help the clerks and salesmen employed by these importers. Every employe's situation would be sought by a horde of unemployed, and their wages would be cut down.

The *Times*, which we must admit is perfectly consistent in its advocacy of cheap labor and low tariff, is a better representative of foreign than of American interests.

The American Free Trade League will meet in Chicago, November 18th and 19th, holding its annual conference. No doubt Chicago is getting to be a very wicked city in the eyes of free traders, as the protection sentiment is steadily growing there. It is not likely that the league will develop anything to arrest this progress.

The annual parade of workingmen last week in this city was characterized by a new feature. Quite a number of working girls took part in the parade, riding in carriages. In all, about 9,000 were in the procession, and it presented a very creditable appearance. Numerous bands discoursed marching music, and everything seemed to be well conducted.

There is no law against the truck-pay system in this State, but when a manufacturer proposes to pay workmen in whiskey it is time to hunt up some law that will act as a restriction. Daily newspaper reports say that a firm of stove manufacturers in Albany were recently refused a license to serve their workmen with liquor. They have a lot of non-union moulders who have taken the place of men on strike. These moulders are not allowed to leave the works, being fed and lodged in the building. The strike has been in progress seventeen weeks.

We are accustomed to read encomiums upon railroad management for getting fast trains over their roads, but the engineer seldom comes in for any share of the credit. Now, it is particularly true of American roads that the ability to run fast trains is largely due to the man at the throttle, and it is a satisfaction to know that this is sometimes, if very rarely, appreciated. We are moved to the above by observing that the *World* so far understands the case as to publish a portrait—and it is much better than the average *World* portraits—and short sketch of the life of George Carpenter, who runs the *World's* special delivery train from Willimantic to Boston. The most noticeable thing in Mr. Carpenter's life is that though he tried, by force of circumstances, several occupations, he came back to his early love, which was locomotive engine-running. The *World* credits him with making a mile in forty-three seconds with its train.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials, nor location will be published.

(266) J. J. B., McKeesport, Pa., asks: If I give you a screw to cut 3" diameter, ¾" pitch, double thread, what will be the distance between each and every thread? *A.*—This is argued both ways. We should say the distance would be ¾".

(267) G A K, Boston, Mass., asks: If I should put a given quantity of water in a boiler, and convert it into steam, then if I superheat this steam would I get more pressure on the boiler? *A.*—Yes; the pressure will increase with every degree of heat added to the steam, but in exactly what proportion has never been definitely settled.

(268) J A., Castleton, N. Y., asks: For what other reasons, besides being out of line or keyed too tightly, do crank-pins heat? *A.*—They will heat if not large enough for the work; if good lubrication is not provided; if dirt gets inside the brasses; if the brasses are not properly fitted, or if

the brasses or pin are not of good material and smooth. Sometimes, when an engine is working the springing of parts will throw it out of line.

(269) D. T. J, Christiana, Pa., asks: 1. What is meant by a high-speed engine? *A.*—An engine of comparatively short stroke, in which high piston-speed is had by a large number of revolutions per minute. 2. What are its advantages *A.*—We refer you to the discussion of this question by Charles T. Porter, in the AMERICAN MACHINIST of Aug. 9, 16, and 23; Sept. 27; Oct. 11 and 18; Nov. 15 and 29, 1879; Jan. 24; March 20; May 22; Aug. 28; Oct. 2, and Nov. 6, 1880.

(270) F. J., La Crosse, Wis, asks: How can I harden the face of an anvil? *A.*—Success in this depends upon keeping cold water in contact with the anvil face. Where there is a natural waterfall handy, the anvil, properly heated, may be placed underneath it; or an artificial waterfall may be made, or placing the anvil in some improvised tank or reservoir, water may be played from a hose against the face. We are not acquainted with the process of making tarred string.

(271) F. D., New York City, asks: 1. What makes an engine pound on the outer center? *A.*—This can only be told after an examination. Perhaps the valves are not properly set, or the engine out of line. 2. What are the bolts called that hold braces? *A.*—We should call them brace-bolts. 3. What are stay-bolts? *A.*—Bolts threaded their whole length, and screwed through flat surfaces opposite each other, and riveted over at the ends. Look at the outside of the firebox of the first locomotive you see, and you will see the ends of stay-bolts.

(272) J. A. M., Rockford, Ind., writes: We have 8,000 ft. of 1-inch heating pipe. The lowest drip of which is 2 feet above water line in boiler. We carry 70 lbs. steam and run engine. Pipes are 250 feet away from boiler, and take steam direct. We carry 70 lbs. pressure. Can the drip be returned to boiler by placing check-valve near boiler? *A.*—Probably you could return drip if you keep full boiler pressure on heating pipes. We say probably, because we do not fully understand the arrangement. We should suppose, however, that it would be better to use a steam trap.

(273) W. T., Chicago, Ill., asks: 1. What proportion of the indicated horse-power of a locomotive is absorbed in moving itself? *A.*—We do not know of sufficient data for determining this. See AMERICAN MACHINIST, Aug. 8, 1885. 2 Is wet steam necessarily of lower temperature than dry steam? *A.*—No. 3. What is superheated steam? *A.*—Steam that is heated after its formation. Superheated steam has heat in excess of that required to maintain the water in the form of steam. 4. What is the distinction between hard and soft coal? *A.*—Anthracite coal is usually called hard coal, because it is hard; it contains very little bitumen. Bituminous coal is called soft coal because it is soft. It contains considerable bitumen.

(274) C. W. S. gives particulars of the setting of a 54-inch by 16-foot boiler. They run a 12″x24″ plain slide-valve engine, 120 revolutions per minute. The engine turns 500 feet of 1¾-inch shafting 280 revolutions per minute, driving machinery. There is also a 1¼-inch pipe from boiler to shop taking steam all the time; boiler pressure, 55 lbs. He burns 400 lbs. Cumberland coal and 1,100 lbs. of screenings per day, presumably of 10 hours. He asks: "Is there anything wrong about boiler setting, and do I burn too much coal?" *A.*—We have no means of knowing how much work you are doing with engine, or how much steam you use from the 1¼″ pipe. Our opinion, from what you write, is that you are getting along very economically, and do not believe you will be able to do better unless by the use of a smaller engine. Your boiler setting appears to be right.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

J. Clayton, Air Compressors, Rock Drills 43 Dey st, NY

Edw. Sears, wood engraver, 48 Beekman st., N.Y.

Presses & Dies, Ferracute Mach. Co, Bridgeton, N.J.

Steel Name Stamps, &c. J.B. Roney, Lynn, Mass.

Tack, wire, and shoe nail machinery; Wm. A. Sweetzer, Brockton, Mass.

Treatise on gear teeth and bevel gears; specimen pp. free. Geo. B. Grant, 66 Beverly st., Boston, Mass.

Universal grinders for lathe-centers, chucks, angles, or cylinders. C.C. Hill, 84 Market st., Chicago, Ill.

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

R. Dudgeon, 24 Columbia st, New York. Improved Hydraulic Jacks and Roller Tube Expanders.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 86 John st., N. Y.

Improved Labor-Saving Upright Drills: prices reasonable. Currier & Snyder, Worcester, Mass.

The latest Improved Tack and Match Machinery is made by White Machine Co., Waterbury, Conn.

Foot-Power Machinery for workshop use, sent on trial if desired. W. F. & Jno. Barnes, Rockford, Ill.

Lyman's Gear Chart. How to lay out gear teeth. Price, 50c. E. Lyman, C. E., New Haven, Conn.

Lathe tools, improved threading tools, cutting-off tools. Catalogue sent. H'tf'd Tool Co., Hartford, Ct.

Upright power hammers, unequaled for die work run at high speed. Williams, White & Co., Moline, Ill.

Send ten cents for 98-page catalogue of scientific books. D. Van Nostrand, 23 Murray st., N. Y.

Selden Packing for stuffing box, with or without rubber core Randolph Brandt, 38 Cortlandt st., N.Y.

Engine Lathes, Hand Lathes, and other fine tools. Assortment large: prices low. Frasse & Co., 62 Chatham st., N. Y.

Farley's Reference Directory of the Machinists', Iron, Steel and Metal-Working trades of the United States. A. C. Farley & Co., Philadelphia, Pa.

Files recut without drawing temper, about one-half usual prices; samples recut free; prices on application. The Acme Co, Collinsville, Conn.

The outline ("wax process") engravings shown in the AM. MACHINIST each week are made by Struthers, Servoss & Co., 24 to 34 New Chambers St., N.Y.

"Complete Practical Machinist," $2.50; "Mechanical Drawing Self-Taught;" $4. Books for workmen. Joshua Rose, Box 3306, New York City.

Morrison's Practical Engineer, a complete treatise on steam and general machinery. Price, $1; mailed free Indicators, Engineers' Instruments and outfits. W. A. Morrison, Box 373, Lowell, Mass.

Stevens & Thompson (paper manufacturers), North Hoosic, N. Y., say: "Have used six Kellam Regulators for two years. They work to our perfect satisfaction" Hine & Robertson, 12 Cortlandt street, N. Y., sole agents.

Locomotive Engine Running and Management. By Angus Sinclair. Gives full directions about handling and repairing locomotives; instructs how to design valve gear and set valves; Westinghouse air brake explained by aid of engravings. Price, $2. For sale by *National Car Builder*, 187 Dearborn st., Chicago, Ill.

Every young man who aspires to be either a mechanic, merchant, or manufacturer, owes it to himself that he become thoroughly familiar with the writings of Chordal. John Wiley & Sons, 15 Astor Place, N. Y., have issued a new and enlarged 12 mo edition of "Extracts from Chordal's Letters." Handsomely bound in cloth, with over 50 illustrations. Price, $2. Discount of 25 per cent on orders for five or more copies.

MANUFACTURES

Wm J. Murphy will erect a $45,000 chair factory in Detroit.

The Progress Machine Works, Meridian, Miss., will be enlarged.

John Pipper will build a foundry at 186 Plymouth street, Brooklyn.

Cassapolis, Mich., is talking about a new foundry and machine shop.

The Millerstown (N. Y.) Iron Co. will erect a charcoal blast furnace.

The Louisville (Ky.) Furniture Co. will erect a $12,000 furniture factory.

James McKenzie will enlarge his boiler shop, foot St. Auburn ave., Detroit, Mich.

The Blake Steam Pump Works, in Boston, continue to be crowded with orders.

The Electric Clock Co., Attleboro, Mass., have selected a site to build a factory.

Ellis & Lessig, Pottstown, Pa, have increased the wages of their nailers 12 per cent.

Wickwire Bros., manufacturers of wire fencing, etc., Cortland, N. Y., will erect a new brick factory.

S. R. White & Co., Norfolk, Va., manufacturers of agricultural implements, are building a large foundry.

The Hecla Mining Co. recently ordered a special size of the Dallett portable drill. It will drill a hole 2″ diameter.

The Glen Manufacturing Company is building a pulp and paper mill at Berlin, which will employ 200 operatives.

Brooks, Tyler & Barker, Selma, Ala., will build a 60×50 ft. foundry, to run in connection with their machine shop.

The Reading Foundry and Machine Co., of Reading, Pa., will erect a new pipe foundry, engine-house and office.

The round-house of the Pan Handle Railroad at Newark, Ohio, has been destroyed by fire. Estimated loss, $6,000.

J. B. Michner, of Kokomo, Ind., will erect an iron foundry at that place. Work will be commenced immediately.

The Nashua Iron and Steel Company are rebuilding their bar rolling mill at Nashua, N. H., which was burned last winter.

The Beaumont Iron Works, Beaumont, Texas are building a foundry. Will have two cupolas, one 40 feet and one 24 feet.

Frank P. Flesh, of the Birmingham Stove Works, Birmingham, Ala., is endeavoring to establish a bolt and nut factory in that city.

Franklin Ward, of Rockford, Ill., has purchased land in Lowell, Mass., and will erect a large brick foundry and machine shop.

The Woodward Iron Company, of Wheeling, Ala., it is reported, have arranged to build another furnace of 80 tons daily capacity.

A. A. Martinez and others, of New Orleans, have formed a company to manufacture the Martinez lubricator. Will soon build a factory.

A new valve-gear is being brought out in Philadelphia. By its use an engine with Corliss valves can be run 250 to 300 revolutions per minute.

A. J. Michaelis, and others, New Orleans, La., will erect an ice factory to cost about $100,000. Work on it will probably commence at once.

The R. A. Belden Co., Danbury, Conn., have moved into a new shop, and have better facilities for making drop forgings and machinists' tools.

The Fernbrook Mfg. Co has been formed by W. & J. Sloan and Wm. R. Grace & Co, of New York, to start a large ingrain carpet mill in Yonkers, N. Y.

The Niagara Stamping and Tool Co., of Buffalo, N. Y., have moved into a new shop 135×50 feet, four stories high. They will erect a foundry 40×80 feet.

Emil Berolzheimer, 73 Franklin street, New York, will erect a four-story brick factory and boiler-house on 147th street and Brook ave., to cost $100,000.

Schofield & Mason, Philadelphia, will erect a four-story carpet factory on Cumberland street, between Fairhill and Reese streets. It will cost about $35,000.

The Sheldon Axle Works will probably locate in Wilkesbarre, Pa, the $100,000 capital stock which they tried to place as a condition having been taken.

The Dodson Nut Lock Co., is being organized in Birmingham, Ala., to build works to manufacture bolts, nut locks, fish plates, etc. Capital stock, $100,000.

The Chesapeake & Nashville Railway Co., Nashville, Tenn., are negotiating for property on which to establish machine shops.—*Baltimore Manufacturers' Record.*

J. S. Lane, formerly of the Webster, Camp & Lane Machine Co., Akron, Ohio, has taken the position of superintendent of the M. C. Bullock Mfg. Company, Chicago.

The Allison Mfg. Co., Philadelphia, are putting the Eastern portion of their shops in perfect repair New skylights are being added, and other improvements are in progress.

The Brant Mfg. Co., a new corporation at New Britain, Conn., will manufacture piano hardware and machinery. It will succeed a business formerly located at Milldale.

The American Watch Company, of Waltham, Mass., has received an order from Japan for a large number of watches. The cases are to be engraved with Japanese characters.

The Cleveland Woolen Mills (C. L. Hardwick, supt.), Cleveland, Tenn., will rebuild their woolen mills at once; will shortly purchase machinery. Mill and machinery will cost $40,000.

Moulders employed in the stove foundry of Chas. Noble & Co., Philadelphia, were lately granted an increase of 10 per cent. in their wages, with the condition that they work on half time.

Wiebusch & Hilger, 84 and 86 Chambers street, New York, have become sole agents for J. Stevens & Co.'s shot-guns, rifles and pocket-rifles. Charles Folsom is in charge of their gun department.

Moulders in the co-operative iron foundry of Cline & Co., Wilmington, were lately granted an advance of 10 per cent in their wages, and it is understood the foundry will be run in the future on full time.

The city council of Dover, N. H., has voted to exempt from taxation for ten years the Somersworth Machine Shop and Bobbin Company, Great Falls, which is moving its shops to Dover. It will employ 300 hands.

The Chicago, Burlington and Northern Railroad contracts, aggregating $1,500,000, were let recently Thirty-five engines will bebuilt by the Rhode Island Locomotive Works. All the coaches are to be constructed at Pullman.

Marshall (Tex.) is worked up to a high fever of excitement over the loss of the T. & P. offices and shops, and proposes to institute legal proceedings against the road for $400,000 given them to locate the shops and offices there.—*Abeline Reporter.*

The Fairchild Paper Co., Boston, Mass., have recently placed a 500 horse-power Harris-Corliss engine in their factory at Pepperell, Mass., for use during the low-water season. This firm is now using eleven steam engines, against one in 1879.

The proprietors of the Falcon Iron and Nail Company, whose works in Niles, Ohio, were burned not long since, contemplate starting a steel wire mill in Youngstown, if a favorable site can be secured. They have increa ed their capital from $75,000 to $100 000.

The citizens of Norway, Me., thoroughly aroused over the attempts of the Knights of Labor to get L. P. Bartlet & Co 's shoe factory removed to Lynn, held a mass meeting, and, after a conference with the firm, decided to build a new factory 200×60 ft, and four stories high, which, along with the old one, the firm will lease for 5 years, and pay 5 per cent. on the investment.

Gubernatorial elections occur in several State this fall, but the Gardner governor has already been elected by a large majority. The Gardner Governor Co., Quincy, Ill., write us: "Our sales for July and August were larger than any other two months in the past two years."

The party of Eastern capitalists who have leased the Vulcan Steel Works, South St. Louis, have taken out articles of incorporation under the name of the Western Steel Company. Capital stock, $125,000; one-half paid up. It is expected that everything will be in readiness to start up the works with a large force of men by Oct. 1.

Armory Dexter, J. D. Hough, M. M. Hirsch, F. J. Jenkins and F. E. Blanchard, of Columbus, Ga., have organized a company to erect a cotton seed oil mill at Americus, Ga., and to manufacture fertilizers, wool, cotton, etc. Capital stock, $25,000, with privilege of increasing to $50,000. Principal office to be at Americus, Ga.—*Baltimore Manufacturers' Record.*

Francis H. Easby, of Philadelphia, manufacturer of special machinery, writes us: "My shop has been busy for the past month on repair work, and though at this writing no new work is coming in still things seem to be getting better. At present I am pushing forward some 10′ screw-cutting lathes, 5 feet bed, with compound rest and power-feed in either direction along the bed."

J. D. Hollister, superintendent of the Florida Southern Railroad, writes us: "While nothing definite has been decided upon relative to increasing capacity of our main shops, yet the fast increasing length of line and volume of business, with consequent increase of equipment, will necessitate such increase after a while. It is contemplated putting small repair shops at Eustis, Fla., for equipment on St. J. & L. E. Div."

A Pittsburgh manufacturer has just signed a contract for building three furnaces for the Troy (N. Y.) Steel and Iron Co., at a cost of over $700,000, the work to be finished December 31, 1886. There will be used in the construction of the new plant 3,350 tons of castings, wrought and plate iron; 3,500,000 fire-bricks, and 3,500,000 red bricks. All the iron used in the construction of the buildings, and all the machinery, will be made at New Castle.

E. Gould & Eberhardt, Newark, N. J., have issued a very neatly printed and tastefully arranged illustrated catalogue of machine tools made from newly designed patterns. Eberhardt's universal automatic gear cutter, Eberhardt's new drill, and various other machines made by this firm, such as shapers, lathes, and other tools, have been illustrated in the AMERICAN MACHINIST. The catalogue shows several new tools. All are described. The catalogue will be mailed to any machinery user upon request.

The Craig Double Sight-Feed Lubricator Co., Lawrence, Mass., write us: "We are pleased to state that our business has largely increased, and looks better than at any time for 12 months. Our locomotive cup, which you illustrated July 11, has been given the preference in every case when tested with other make of cups. They have also been tested by some of the best locomotive builders in the country, and are now generally used and recommended by them. This we consider a little luck, which your illustration helped to bring about, as it seemed to reach a great many railroad men. We have a number of orders ahead."

The De La Vergne Refrigerating Co., 157 Bank street, New York, say that the contractors who manufacture for them give indications of better times by increasing stiffness in prices. This firm has recently added a Pratt & Whitney lathe, a heavy Bullard turret lathe, and have ordered another lathe from each of the above makers. At the Philadelphia exhibition this company will present, among other apparatus, a unique exhibit in the form of an ice fountan. A shower of water will fall upon a system of pipes containing ammonia, and ice will form upon the pipes to a thickness of over fifteen inches, even in a temperature of over 60°.

E. T. Burrowes & Co., Portland, Me., have completed the foundation for their new factory on Spring street. The building will be 50×100 feet, and five stories high, and will be all occupied by the firm in the manufacture of their patent wire screens, which have a large and increasing sale in all parts of the country. The building will be heated by steam, and will have new machinery, engine, boiler, dry-houses and elevator. The firm also own the land adjoining on Center street, now occupied by three tenement houses, and propose, in a year or two, to erect on it another building similar to the one now under construction.—*Industrial Journal.*

The Illinois Central Railroad Company have got 12 Rogers locomotives in service that have been running over 30 years, and they still have the original boilers in use. Most of these engines are light, weighing about 25 tons, and have cylinders 15×22 inches, and wheels 5 feet in diameter. The engines are now getting too light for the work of the road, and they will probably be cut up within a very few years, and the company can well afford to put the engines aside, for few locomotives have earned an equal amount of money. The oldest engine still running on the road is a Rogers make, which has been in service 33 years. Nearly 30 years ago this engine was run for some time by Mr. Morris Sellers, the well-known railroad supply dealer, and at that early day the engine was regarded as a wonder among locomotives, owing to the astonishing weight of trains she could pull.—*National Car Builder.*

The Penn. Iron Works, Philadelphia, are completing an iron tug-boat for service on the Delaware river. Tonnage, 46 43-100; speed to be 12 knots; steam, 90 lbs.; revolutions of screw, 120.

The cable roads of Philadelphia do not as yet work satisfactorily to the public, but work is steadily progressing on one or two new lines, and engineering talent is being pushed to its utmost to make the cable road a success.

Machinists' Supplies and Iron.

NEW YORK, Sept. 10, 1885.

There is in supply and manufacturing business, a continuance of the recent good feeling. While there has been little or no advance in prices, the demand appears to be slowly increasing. Even a slight break in the way of advanced prices would, at this time, if sustained, undoubtedly stimulate trade, but dealers are slow to make it for fear of the consequences of having to abandon it. No startling developments need be looked for in the next few weeks, but higher prices must come with the better feeling that is almost universal.

Iron—There has been a little better demand for American pig. Consumers have in many instances contracted ahead. The supply is as yet equal to the demand, but increased orders induce a better feeling among furnacemen. In prices we quote No. 1 X Foundry, $18, with outside brands $17.50; No. 2 Foundry is quoted at $16 to $16 50; Grey Forge, at furnace is still quoted at $13.50 to $14 50.

Scotch Pig—In these brands the market has been quiet, sales being only in small lots. We quote Shotts $19.50 to $20; Coltness, $19.50 to $20; Glengarnock, $18 50 to $19; Gartsherrie, $19.50; Summerlee, $19 to $19.25; Carnbroe, $18.50 to $19; Eglinton, $17.50 to $18; Langloan, $19.50 to $20; Dalmellington, $18 to $18.25.

Copper — No important transactions have occurred. Dealers are inclined to hold prices steady at 11¼c. for Lake, and 10¼c. to 10¾c. for other brands.

Lead—Sales are reported at 4 25c.; dealers are not disposed to sell at lower figures; buyers offer less, and buy only for pressing wants.

Tin—Owing to the unsettled condition of the London market, the market has been unsteady. Jobbing lots of Banca are quoted at 20¾c. to 20⅞c.; Straits and Malacca, 21c. to 21¼c.

Spelter—Refined, 4.75c. to 5c.

Antimony—Hallett's 8¾c.; Cookson's 9¼c.

✻WANTED✻

"Situation and Help" Advertisements, 30 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

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Wanted—By practical mechanic, designer and draftsman, position as supt. or foreman of machine works; have had large experience handling men and systematizing work; best references given; c'rresp'ce solicited. Address Box 486, Waterbury, Ct.

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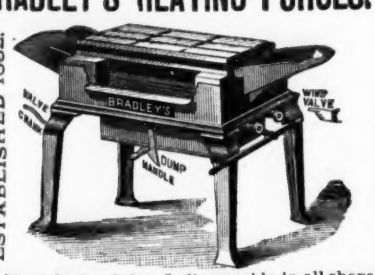

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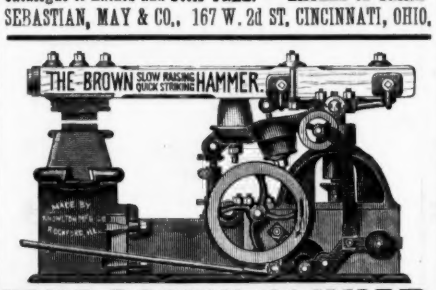

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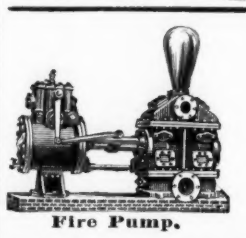

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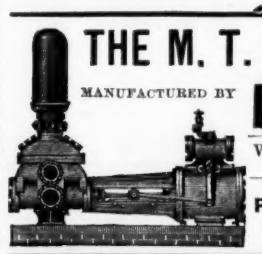

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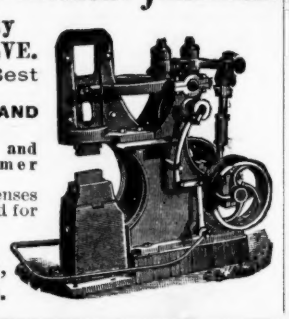

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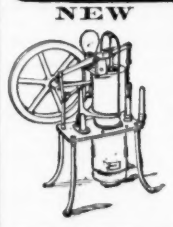

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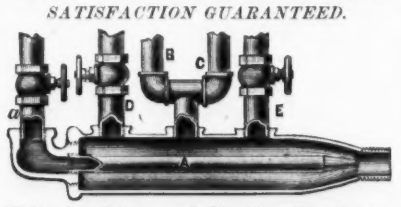

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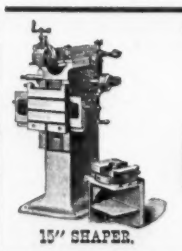

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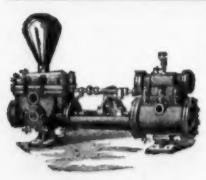

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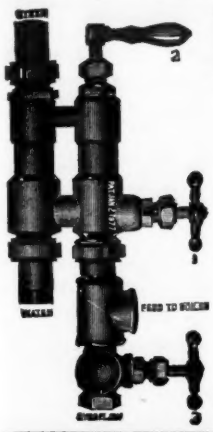

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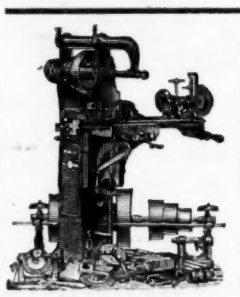

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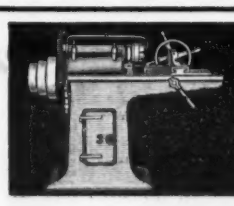

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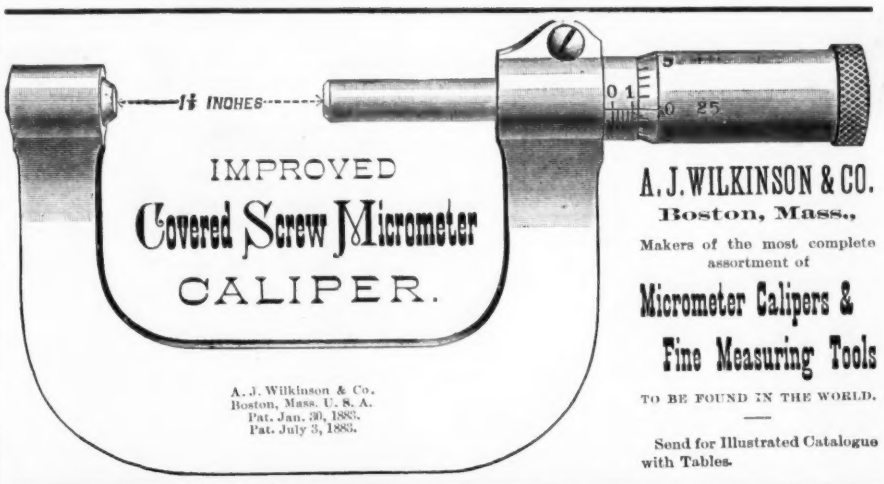

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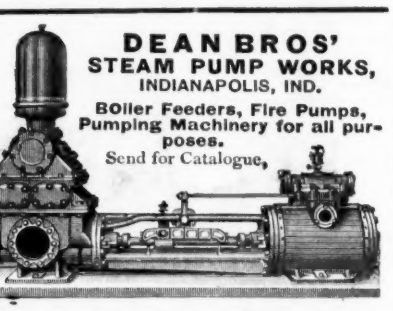

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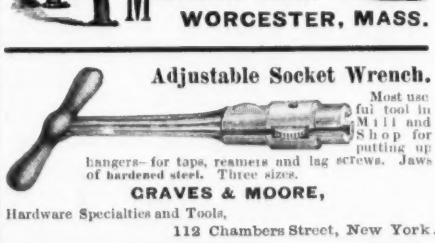

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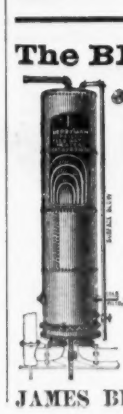

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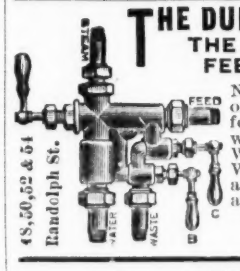

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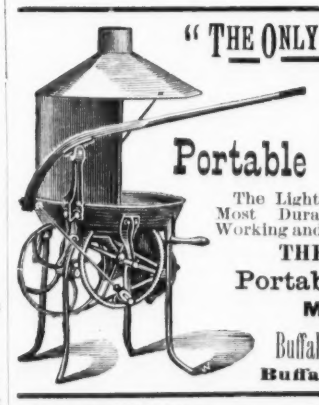

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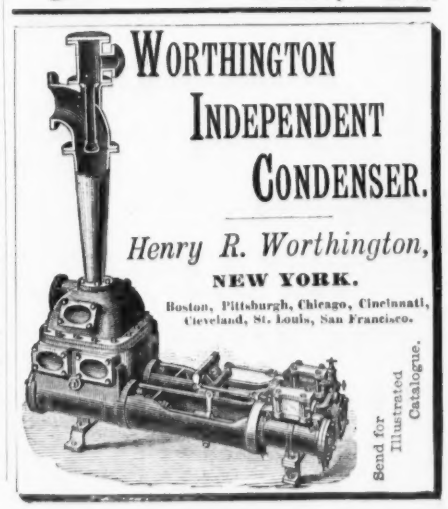

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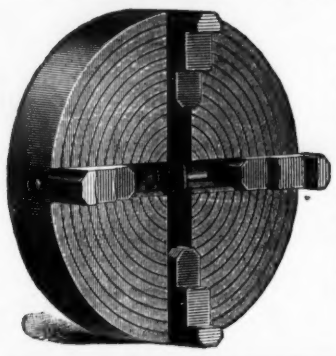
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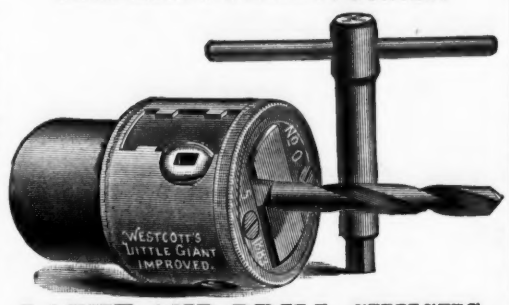

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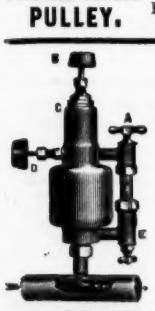
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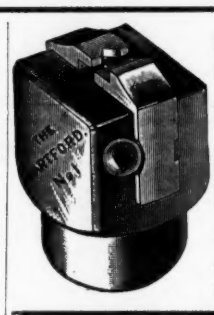
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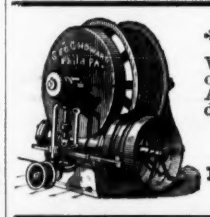
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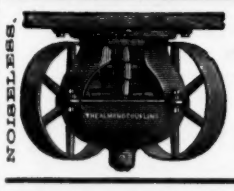
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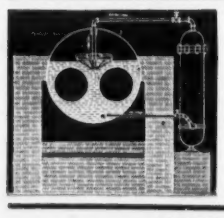
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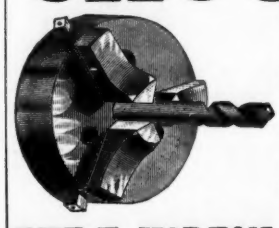
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NOTICE.

Week before last we published, under this heading, references to a small portion of the practical articles that have been specially prepared for the AMERICAN MACHINIST, and have appeared in our columns during the last few months. Last week we published an additional list. We append another list below. No other mechanical journal in this country has or ever has had such a collection of practical articles, by writers of well known ability, as are presented in these columns week by week. Every issue gives information that is taken up and applied in the shops and factories in various parts of the country. Copies containing these articles can be readily obtained by ordering of any newsdealer, or by writing to this office, at 5 cents per copy.

Wm. M. Barr.
Kaolin and Plaster of Paris as a Boiler Covering May 17, 1884
Another Explosion in a Pump Plunger. May 31 1884

Frank H. Ball.
Balancing the Reciprocating Parts of Steam Engines January 3, and February 21, 1885.

Frank H. Richards.
Something About Chucks. January 12, 1884
Running a Lathe. January 12; February 23; March 1; May 3, 17, 1884
Grinding and Using Cutting Tools. May 2, 1885
Grinding Tools Again. June 6, 1885
Screw Cutting on the Engine Lathe. June 13, 1885
Pay Days and Early Closing. August 15, 1885.
Twist Drills and Twisted Arithmetic. July 25, 1885.

George Escol Sellers.
Early Engineering Reminiscences. June 7, 14; July 12; August 9, 23; October 11, 25; November 1; December 13, 20, 1884. February 28 March 14; April 11, August 22, 1885

John W. Nystrom.
Inertia Diagram. Dec. 27, 1884
Inertia. Aug. 30, 1884

George Marshall.
The Result of Imperfect Setting of Horizontal Tubular Boilers. May 24, 1884.
Form and Material of Boilers. June 14, 1884
Agricultural Boilers. September 27, 1884
Boiler Chimneys Considered from an Economical Standpoint. August 16, 1884
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Boiler Fittings, Boiler Tests and Inspection. Feb. 16, 1884
Boiler Plate Stamps, Laminated Plates and Steel Plates. April 26, 1884
Use of Mild Steel in Boiler Construction. March 8, 15, 1884
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Pitch of Milling Cutter Teeth. October 4, 1884

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Draft and Finish of Patterns. May 31, 1884.
Making 18" Face Pulley from a 12" Pattern. November 15, 1884

Thos. D. West.
Sound Castings. December 6, 1884
Small Castings. March 15 1884
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S. W. Goodyear.
Personal Recollections. January 12, February 9, March 15, 1884; July 18, 1885
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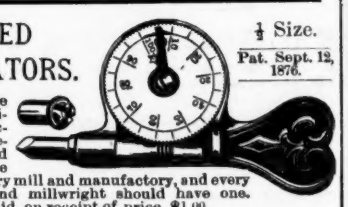

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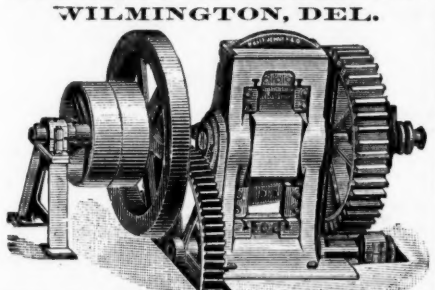

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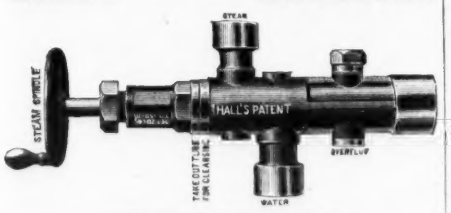

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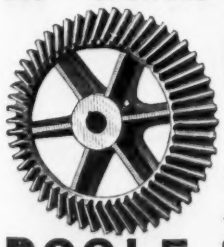

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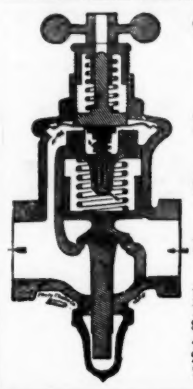

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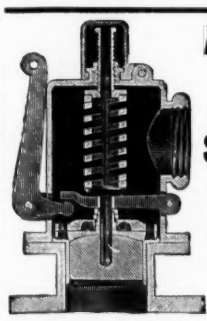

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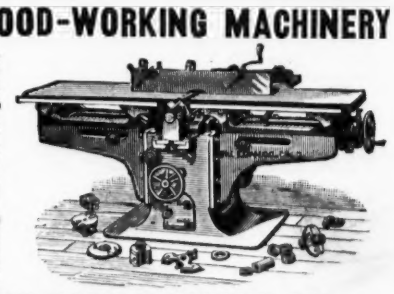

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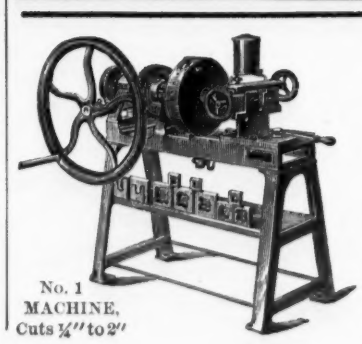

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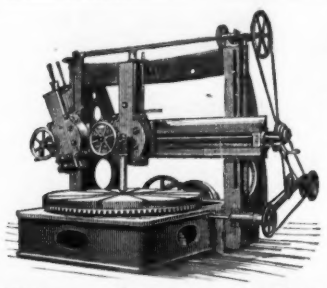

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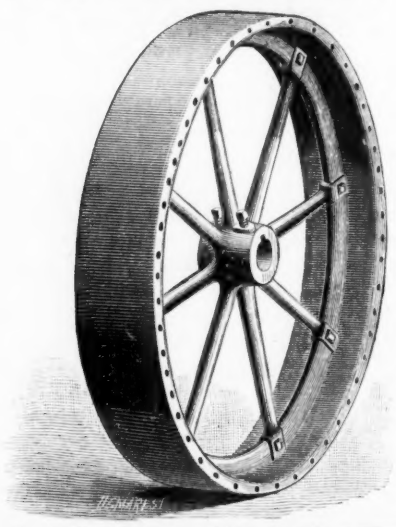

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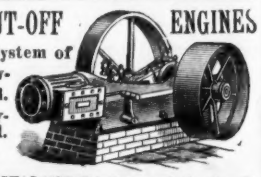

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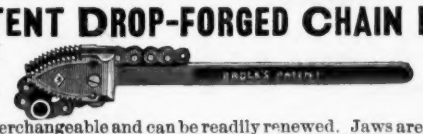

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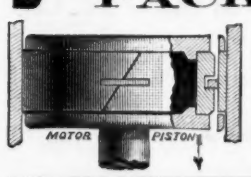

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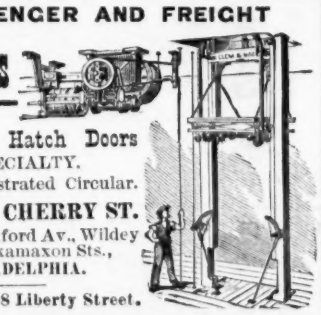

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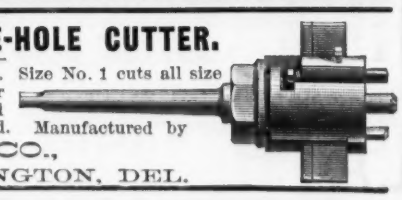

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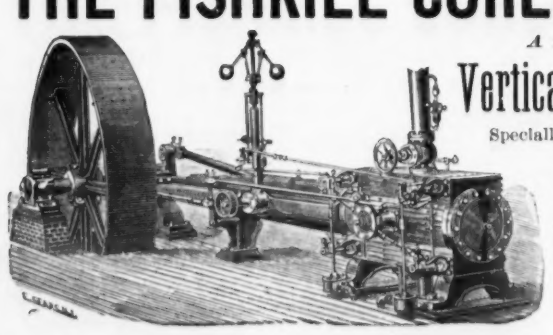

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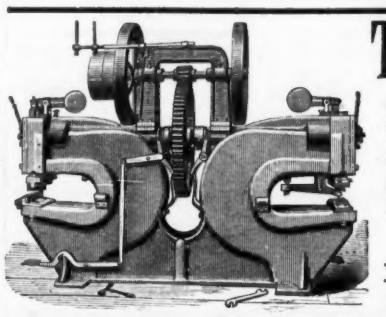

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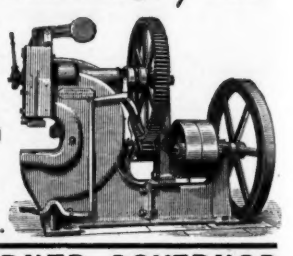

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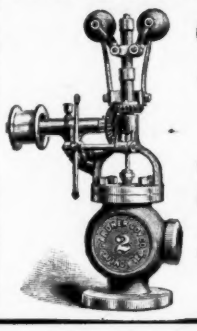

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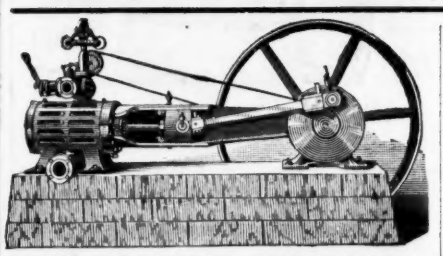

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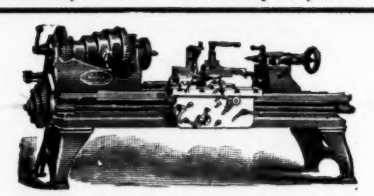

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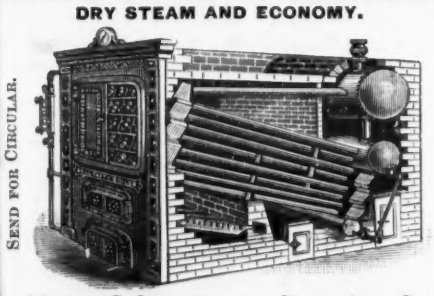

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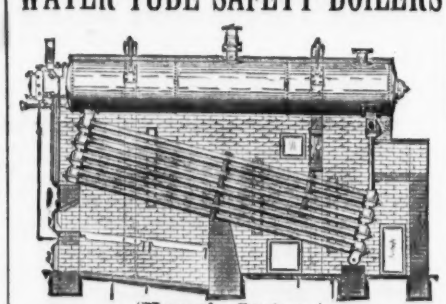

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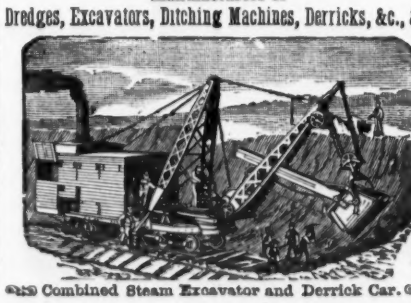

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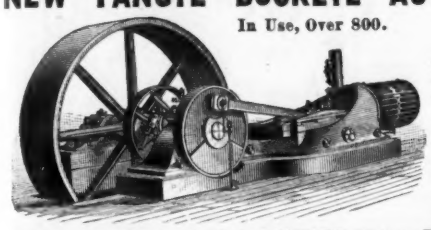

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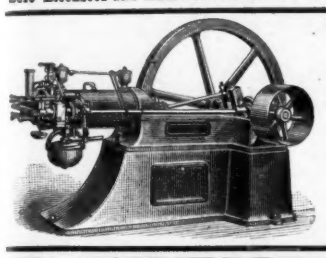

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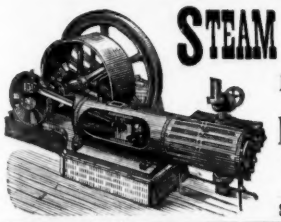

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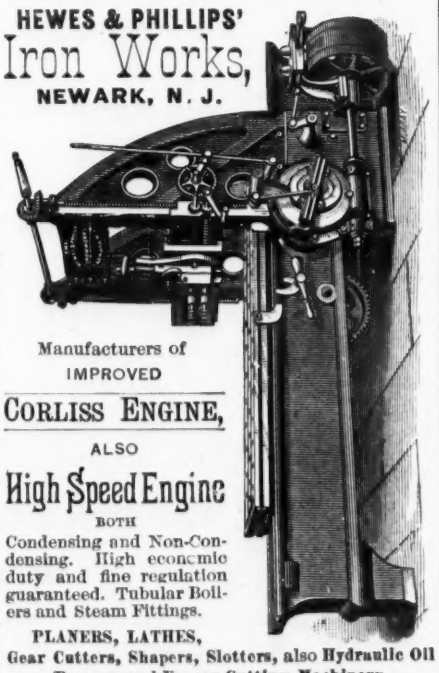

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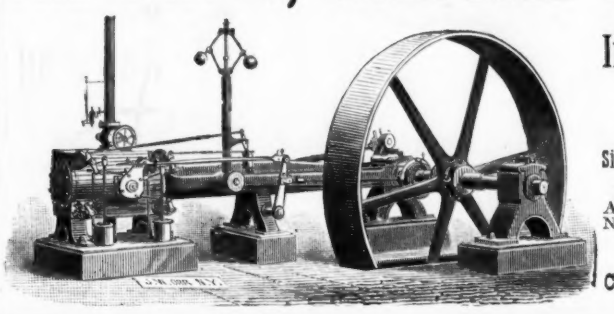

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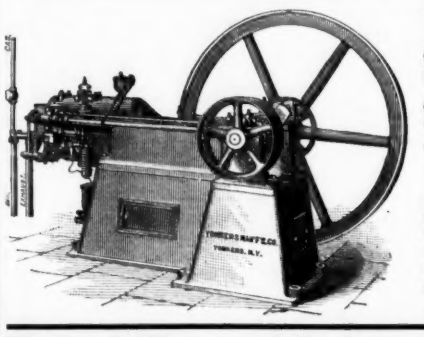

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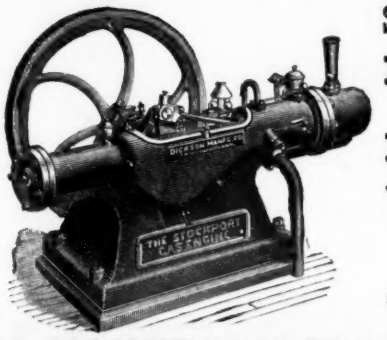

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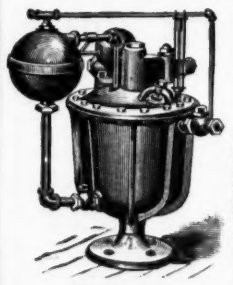

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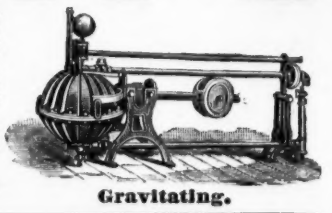

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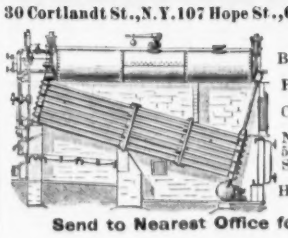

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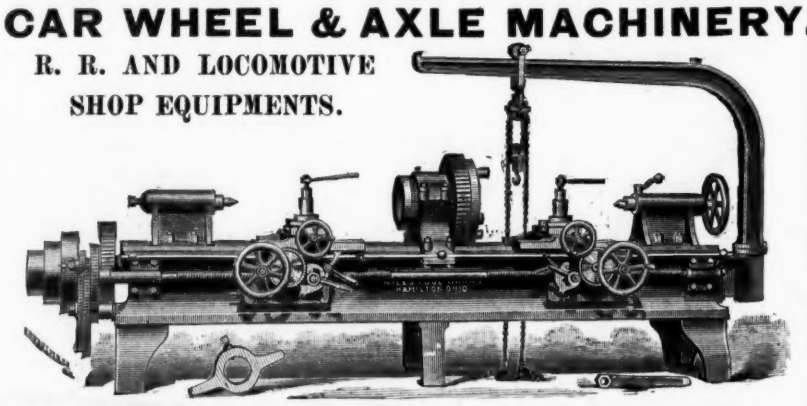

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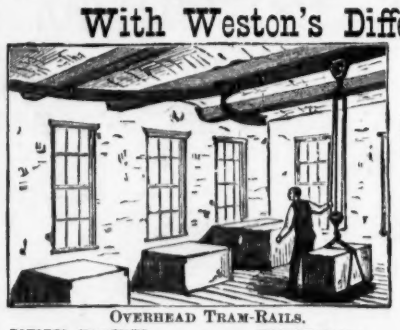

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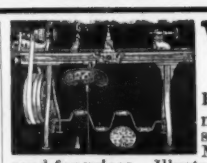

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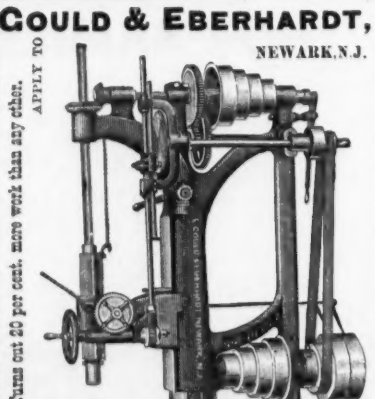

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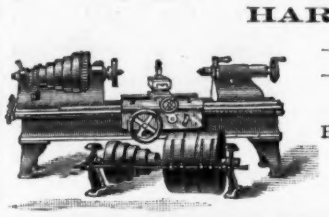

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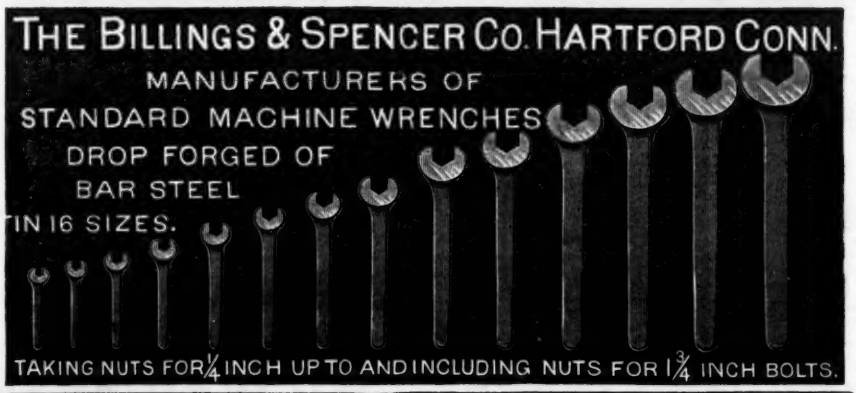

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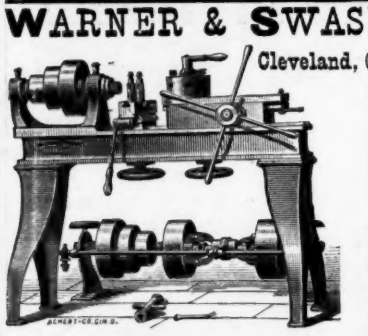

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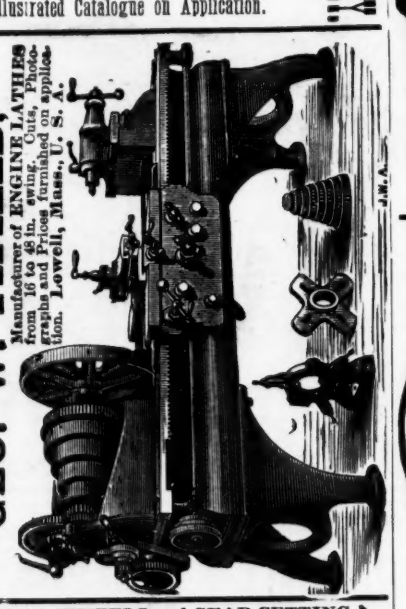

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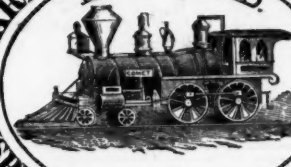

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